# Appendix A

## Air Toxics Hot Spots Program

## List Of Substances*

*The List of Substances presented in Appendix A is periodically updated by the California Air Resources Board. The last update was July 1, 1997.

# Appendix A-I

## Substances For Which

## Emissions Must Be Quantified

## July 1, 1997

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

APPENDIX A-I
Substances For Which Emissions Must Be Quantified

| Emittent ID Other (Note [1]) Notes(s) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Applicable Degree of Accuracy (lb/yr) (Note [5]) | Source List(s) (Note [6]) |
|---|---|---|---|---|---|
| 75070 | Acetaldehyde | | c | 20. | 1 2 3 4 |
| 60355 | Acetamide | | c | 2. | 1 2 3 4 |
| 75058 | Acetonitrile | 06/91 | | 200. | 1 2 |
| 98862 | Acetophenone | 06/91 | | 100. | 1 2 |
| 53963 | 2-Acetylaminofluorene [PAH-Derivative, POM] | | c | 100. | 1 2 4 5 |
| 107028 | Acrolein | | | 0.05 | 1 2 |
| 79061 | Acrylamide | | c | 0.01 | 1 2 3 4 |
| 79107 | Acrylic acid | 06/91 | | 5. | 1 2 |
| 107131 | Acrylonitrile | | c | 0.1 | 1 2 3 4 5 |
| 107051 | Allyl chloride | | c | 5. | 1 2 4 |
| 7429905 | Aluminum | 06/91 | | 100. | 1 |
| 1344281 | Aluminum oxide (fibrous forms) | 06/91 | | 100. | 7 |
| 117793 | 2-Aminoanthraquinone [PAH-Derivative, POM] | | c | 5. | 1 2 4 5 |
| 92671 | 4-Aminobiphenyl [POM] | | c | 100. | 1 2 3 4 5 |
| 61825 | Amitrole | | c | 0.1 | 3 4 5 |
| 7664417 | Ammonia | | | 200. | 1 2 |
| 6484522 | Ammonium nitrate | 06/91 | | 100. | 1 |
| 7783202 | Ammonium sulfate | 06/91 | | 100. | 1 |
| 62533 | Aniline | 09/90 | c | 5. | 1 2 4 |
| 90040 | o-Anisidine | | c | 100. | 1 2 3 4 5 |
| - | Anthracene [PAH, POM], (see PAH) | | | | |
| 7440360 | Antimony | 06/91 | | 1. | 7 |
| * | Antimony compounds | 06/91 | | 1. | 1 2 |
| [7] | | | | | |
| | including but not limited to: | | | | |
| 1309644 | Antimony trioxide | 09/90 | c | 1. | 1 2 3 4 |
| [7] | | | | | |
| 7440382 | Arsenic | | c | 0.01 | 1 2 3 4 5 |
| 1016 | Arsenic compounds (inorganic) | | c | 0.01 | 1 2 3 4 5 |
| [7] | | | | | |
| | including but not limited to: | | | | |
| 7784421 | Arsine | | | 0.01 | 1 2 7 |
| [7] | | | | | |
| 1017 | Arsenic compounds (other than inorganic) | 06/91 | | 0.1 | 1 |
| [7] | | | | | |
| 7440393 | Barium | 06/91 | | 1. | 7 |
| * | Barium compounds | 06/91 | | 1. | 1 |
| [7] | | | | | |
| - | Benz[a]anthracene [PAH, POM], (see PAH) | | | | |
| 71432 | Benzene | | c | 2. | 1 2 3 4 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 92875 | Benzidine (and its salts) [POM] | | c | 0.0001 | 1 2 3 4 5 | |
| 1020 | Benzidine-based dyes [POM] | | c | 0.0001 | 1 2 3 | |
| | including but not limited to: | | | | | |
| 1937377 | Direct Black 38 [PAH-Derivative, POM] | | c | 0.0001 | 1 2 4 5 | |
| 2602462 | Direct Blue 6 [PAH-Derivative, POM] | | c | 0.0001 | 1 2 4 5 | |
| 16071866 | Direct Brown 95 (technical grade) [POM] | 09/89 | c | 0.0001 | 1 2 4 | |
| - | Benzo[a]pyrene [PAH, POM], (see PAH) | | | | | |
| - | Benzo[b]fluoranthene [PAH, POM], (see PAH) | | | | | |
| 271896 | Benzofuran | 06/91 | c | 100. | 4 | |

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|---|---|---|---|---|---|
| 98077 | Benzoic trichloride {Benzotrichloride} | | c | 10. | 1 2 4 5 |
| - | Benzo[j]fluoranthene [PAH, POM], (see PAH) | | | | |
| - | Benzo[k]fluoranthene [PAH, POM], (see PAH) | | | | |
| 98884 | Benzoyl chloride | 06/91 | | 100. | 1 |
| 94360 | Benzoyl peroxide | 06/91 | | 100. | 7 |
| 100447 | Benzyl chloride | | c | 50. | 1 2 4 |
| 7440417 | Beryllium | | c | 0.001 | 1 2 3 4 5 |
| * | Beryllium compounds | 09/89 | c | 0.001 | 1 2 3 4 5 |
| [7] | | | | | |
| 92524 | Biphenyl [POM] | 06/91 | | 0.5 | 1 2 |
| 111444 | Bis(2-chloroethyl) ether {DCEE} | 09/89 | c | 0.05 | 1 2 4 |
| 542881 | Bis(chloromethyl) ether | | c | 0.001 | 1 2 3 4 5 |
| 103231 | Bis(2-ethylhexyl) adipate | 06/91 | | 100. | 1 |
| 7726956 | Bromine | | | 0.5 | 2 |
| * | Bromine compounds (inorganic) | | | 100. | 1 2 |
| [7] | | | | | |
| | including but not limited to: | | | | |
| 7758012 | Potassium bromate | | | 0.1 | 1 3 4 |
| [7] | | | | | |
| 75252 | Bromoform | 06/91 | | 100. | 1 2 4 |
| 106990 | 1,3-Butadiene | | c | 0.1 | 1 2 3 4 5 |
| 141322 | Butyl acrylate | 06/91 | | 100. | 1 |
| 71363 | n-Butyl alcohol | 06/91 | | 100. | 1 |
| 78922 | sec-Butyl alcohol | 06/91 | | 100. | 1 |
| 75650 | tert-Butyl alcohol | 06/91 | | 100. | 1 |
| 85687 | Butyl benzyl phthalate | 06/91 | | 100. | 1 |
| 7440439 | Cadmium | | c | 0.01 | 1 2 3 4 5 |
| * | Cadmium compounds | | c | 0.01 | 1 2 3 4 5 |
| [7] | | | | | |
| 156627 | Calcium cyanamide | 06/91 | | 100. | 1 2 |
| 105602 | Caprolactam | 06/91 | | 100. | 1 2 |
| 2425061 | Captafol | 09/89 | c | 100. | 4 |
| 133062 | Captan | 09/90 | c | 100. | 1 2 4 |
| 63252 | Carbaryl [PAH-Derivative, POM] | 06/91 | | 100. | 1 2 |
| 1050 | Carbon black extracts | | c | 2. | 1 3 4 |
| 75150 | Carbon disulfide | 09/89 | | 200. | 1 2 4 |
| 56235 | Carbon tetrachloride | | c | 1. | 1 2 3 4 5 |
| 463581 | Carbonyl sulfide | 06/91 | | 100. | 1 2 |
| 1055 | Carrageenan (degraded) | | c | 100. | 3 4 |
| 120809 | Catechol | 06/91 | | 100. | 1 2 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 133904 | Chloramben | 06/91 | | 100. | 1 | 2 | | | | | | |
| 57749 | Chlordane | 09/89 | c | 10. | 1 | 2 | | 4 | | | | |
| 108171262 | Chlorinated paraffins (average chain length, C12; approximately 60% chlorine by weight) | 09/89 | c | 2. | | | | | 3 | 4 | 5 | |
| 7782505 | Chlorine | | | 0.5 | 1 | 2 | | | | | | |
| 10049044 | Chlorine dioxide | 06/91 | | 1. | 1 | | | | | | | |
| 79118 | Chloroacetic acid | 06/91 | | 100. | 1 | 2 | | | | | | |
| 532274 | 2-Chloroacetophenone | 06/91 | | 0.1 | 1 | 2 | | | | | | |
| 106478 | p-Chloroaniline | 07/96 | | 100. | | | | 4 | | | | 7 |

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|---|---|---|---|---|---|
| 1058 | Chlorobenzenes | 06/91 | | 100. | 1 |
| | including but not limited to: | | | | |
| 108907 | Chlorobenzene | | | 200. | 1 2 |
| 25321226 | Dichlorobenzenes (mixed isomers) | 06/91 | | 100. | 1 7 |
| | including: | | | | |
| 95501 | 1,2-Dichlorobenzene | 06/91 | | 200. | 1 7 |
| 541731 | 1,3-Dichlorobenzene | 06/91 | | 100. | 1 7 |
| 106467 | p-Dichlorobenzene {1,4-Dichlorobenzene} | | c | 5. | 1 2 3 5 |
| 120821 | 1,2,4-Trichlorobenzene | 06/91 | | 200. | 1 2 |
| 510156 | Chlorobenzilate [POM] {Ethyl-4,4'-dichlorobenzilate} | 09/90 | c | 100. | 1 2 4 |
| 67663 | Chloroform | | c | 10. | 1 2 3 4 5 |
| 107302 | Chloromethyl methyl ether (technical grade) | | c | 100. | 1 2 4 5 |
| 1060 | Chlorophenols | | c | 100. | 1 3 |
| | including but not limited to: | | | | |
| 120832 | 2,4-Dichlorophenol | 06/91 | c | 100. | 1 7 |
| 87865 | Pentachlorophenol | 09/90 | c | 10. | 1 2 4 |
| 58902 | 2,3,4,6-Tetrachlorophenol | 07/96 | c | 100. | 1 7 |
| 95954 | 2,4,5-Trichlorophenol | 06/91 | c | 100. | 1 2 |
| 88062 | 2,4,6-Trichlorophenol | | c | 2. | 1 2 4 |
| 95830 | 4-Chloro-o-phenylenediamine | | c | 10. | 3 4 5 |
| 76062 | Chloropicrin | | | 2. | 7 |
| 126998 | Chloroprene | | | 5. | 1 2 |
| 95692 | p-Chloro-o-toluidine | | c | 0.5 | 3 4 |
| 7440473 | Chromium | 06/91 | | 0.001 | 7 |
| * | Chromium compounds (other than hexavalent) [7] | 06/91 | | 0.001 | 1 2 |
| 18540299 | Chromium, hexavalent (and compounds) [7] | | c | 0.0001 | 1 2 3 4 5 |
| | including but not limited to: | | | | |
| 10294403 | Barium chromate [7] | 06/91 | c | 0.001 | 1 2 5 |
| 13765190 | Calcium chromate [7] | 06/91 | c | 0.001 | 1 2 5 |
| 1333820 | Chromium trioxide [7] | 06/91 | c | 0.0001 | 1 2 5 |
| 7758976 | Lead chromate [7] | 06/91 | c | 0.001 | 1 2 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 10588019 | Sodium dichromate | 06/91 | c | 0.0001 | 1 2 5 | [7] |
| 7789062 | Strontium chromate | 06/91 | c | 0.001 | 1 2 5 | [7] |
| - | Chrysene [PAH, POM], (see PAH) | | | | | |
| 7440484 | Cobalt | 06/91 | | 0.5 | | 7 |
| * | Cobalt compounds | 06/91 | | 0.5 | 1 2 | [7] |
| 1066 | Coke oven emissions | | c | 0.05 | 1 2 3 4 5 | |
| 7440508 | Copper | | | 0.1 | 2 | |
| * | Copper compounds | 09/89 | | 0.1 | 1 2 | [7] |
| 1070 | Creosotes | | c | 0.05 | 1 3 4 | |
| 120718 | p-Cresidine | | c | 1. | 3 4 5 | |
| 1319773 | Cresols (mixtures of) {Cresylic acid} including: | | | 5. | 1 2 | |
| 108394 | m-Cresol | 06/91 | | 5. | 1 2 | |
| 95487 | o-Cresol | 06/91 | | 5. | 1 2 | |
| 106445 | p-Cresol | 06/91 | | 5. | 1 2 | |
| 4170303 | Crotonaldehyde | 07/96 | c | 50. | | 7 |

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|---|---|---|---|---|---|---|
| 98828 | Cumene | 06/91 | | 200. | 1 2 | |
| 80159 | Cumene hydroperoxide | 06/91 | | 100. | 1 | |
| 135206 | Cupferron | | c | 0.5 | 4 5 | |
| 1073 | Cyanide compounds | 06/91 | | 0.05 | 1 2 | [8] |
| | including but not limited to: | | | | | |
| 74908 | Hydrocyanic acid | | | 10. | 2 | |
| 110827 | Cyclohexane | 06/91 | | 200. | 1 | |
| 108930 | Cyclohexanol | 07/96 | | 200. | 7 | |
| 66819 | Cycloheximide | | | 2. | 6 | |
| 1163195 | Decabromodiphenyl oxide [POM] | 06/91 | | 100. | 1 2 | |
| 1075 | Dialkylnitrosamines | | | 0.001 | 1 | |
| | including but not limited to: | | | | | |
| 924163 | N-Nitrosodi-n-butylamine | | c | 0.0001 | 1 3 4 5 | |
| 1116547 | N-Nitrosodiethanolamine | | c | 100. | 1 3 4 5 | |
| 55185 | N-Nitrosodiethylamine | | c | 0.001 | 1 3 4 5 | |
| 62759 | N-Nitrosodimethylamine | | c | 0.01 | 1 2 3 4 5 | |
| 621647 | N-Nitrosodi-n-propylamine | | c | 0.01 | 1 3 4 5 | |
| 10595956 | N-Nitrosomethylethylamine | | c | 0.001 | 1 3 4 | |
| 615054 | 2,4-Diaminoanisole | | c | 5. | 3 4 | |
| 1078 | Diaminotoluenes (mixed isomers) | 09/90 | c | 100. | 1 4 | |
| | including but not limited to: | | | | | |
| 95807 | 2,4-Diaminotoluene {2,4-Toluenediamine} | | c | 0.05 | 1 2 3 4 5 | |
| 334883 | Diazomethane | 06/91 | c | 5. | 1 2 | |
| 226368 | Dibenz[a,h]acridine [POM] | | c | 0.5 | 1 2 3 4 5 | |
| 224420 | Dibenz[a,j]acridine [POM] | | c | 0.5 | 1 2 3 4 5 | |
| - | Dibenz[a,h]anthracene [PAH, POM], (see PAH) | | | | | |
| 194592 | 7H-Dibenzo[c,g]carbazole | | c | 0.05 | 1 2 3 4 5 | |
| - | Dibenzo[a,e]pyrene [PAH, POM], (see PAH) | | | | | |
| - | Dibenzo[a,h]pyrene [PAH, POM], (see PAH) | | | | | |
| - | Dibenzo[a,i]pyrene [PAH, POM], (see PAH) | | | | | |
| - | Dibenzo[a,l]pyrene [PAH, POM], (see PAH) | | | | | |
| 132649 | Dibenzofuran [POM] | 06/91 | | 100. | 1 2 | |
| - | Dibenzofurans (chlorinated) (see Polychlorinated dibenzofurans) [POM] | | | | | |
| 96128 | 1,2-Dibromo-3-chloropropane {DBCP} | | c | 0.01 | 1 2 3 4 5 | |
| 96139 | 2,3-Dibromo-1-propanol | 07/96 | c | 50. | 4 | |
| 84742 | Dibutyl phthalate | 06/91 | | 100. | 1 2 | |
| - | p-Dichlorobenzene {1,4-Dichlorobenzene} (see Chlorobenzenes) | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 91941 | 3,3'-Dichlorobenzidine [POM] | | c | 0.1 | 1 2 3 4 5 |
| 72559 | Dichlorodiphenyldichloroethylene {DDE} [POM] | 09/89 | c | 100. | 1 2 4 |
| 75343 | 1,1-Dichloroethane {Ethylidene dichloride} | 09/90 | c | 20. | 1 2 4 |
| 94757 | Dichlorophenoxyacetic acid, salts and esters {2,4-D} | 06/91 | | 100. | 1 2 |
| 78875 | 1,2-Dichloropropane {Propylene dichloride} | 09/90 | c | 20. | 1 2 4 |
| 542756 | 1,3-Dichloropropene | | c | 10. | 1 2 3 4 5 |
| 62737 | Dichlorovos {DDVP} | 09/89 | c | 0.5 | 1 2 4 |
| 115322 | Dicofol [POM] | 06/91 | | 100. | 1 2 |

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|---|---|---|---|---|---|
| - - [9] | Diesel engine exhaust | 09/90 | c | | 1 3 4 |
| 9901 [9] | Diesel engine exhaust, particulate matter | 09/90 | c | 10. | 1 3 4 |
| 9902 [9] | Diesel engine exhaust, total organic gas | 09/90 | c | 10. | 1 3 4 |
| # | Diesel fuel (marine) | 06/91 | c | | |
| 111422 | Diethanolamine | 06/91 | | 20. | 1 2 |
| 117817 | Di(2-ethylhexyl) phthalate {DEHP} | | c | 20. | 1 2 3 4 5 |
| 64675 | Diethyl sulfate | | c | 100. | 1 2 3 4 5 |
| 119904 | 3,3'-Dimethoxybenzidine [POM] | | c | 100. | 1 2 3 4 5 |
| 60117 | 4-Dimethylaminoazobenzene [POM] | | c | 0.01 | 1 2 3 4 5 |
| 121697 | N,N-Dimethylaniline | 06/91 | | 200. | 1 2 |
| 57976 | 7,12-Dimethylbenz[a]anthracene [PAH-Derivative, POM] | 09/90 | c | 0.0001 | 1 2 4 |
| 119937 | 3,3'-Dimethylbenzidine {o-Tolidine} [POM] | | c | 10. | 1 2 3 4 5 |
| 79447 | Dimethyl carbamoyl chloride | | c | 100. | 1 2 3 4 5 |
| 68122 | Dimethyl formamide | 09/90 | c | 100. | 1 2 3 |
| 57147 | 1,1-Dimethylhydrazine | | c | 0.1 | 1 2 3 4 5 |
| 131113 | Dimethyl phthalate | 06/91 | | 50. | 1 2 |
| 77781 | Dimethyl sulfate | | c | 0.01 | 1 2 3 4 5 |
| 534521 | 4,6-Dinitro-o-cresol (and salts) | 06/91 | | 100. | 1 2 |
| 51285 | 2,4-Dinitrophenol | 06/91 | | 100. | 1 2 |
| 42397648 | 1,6-Dinitropyrene [PAH-Derivative, POM] | 06/91 | c | 0.001 | 1 2 3 4 |
| 42397659 | 1,8-Dinitropyrene [PAH-Derivative, POM] | 06/91 | c | 0.05 | 1 2 3 4 |
| 25321146 | Dinitrotoluenes (mixed isomers) including but not limited to: | 06/91 | | 100. | 7 |
| 121142 | 2,4-Dinitrotoluene | 09/89 | c | 0.5 | 1 2 4 |
| 606202 | 2,6-Dinitrotoluene | 06/91 | | 100. | 7 |
| 123911 | 1,4-Dioxane | | c | 5. | 1 2 3 4 5 |
| - | Dioxins (Chlorinated dibenzodioxins) (see Polychlorinated dibenzo-p-dioxins) [POM] | | | | |
| 630933 | Diphenylhydantoin [POM] | | c | 100. | 1 2 4 |
| 122667 | 1,2-Diphenylhydrazine {Hydrazobenzene} [POM] | | c | 100. | 1 2 4 5 |
| 1090 | Environmental Tobacco Smoke | | c | 2. | 1 3 4 |
| 106898 | Epichlorohydrin | | c | 2. | 1 2 3 4 5 |
| 106887 | 1,2-Epoxybutane | 06/91 | | 100. | 1 2 |
| 1091 | Epoxy resins | 09/89 | | 100. | 6 |
| 140885 | Ethyl acrylate | | c | 200. | 1 2 3 4 5 |
| 100414 | Ethyl benzene | 06/91 | | 200. | 1 2 |

| | | | | | |
|---|---|---|---|---|---|
| 75003 | Ethyl chloride {Chloroethane} | | | 200. | 1 2 4 |
| - | Ethyl-4,4'-dichlorobenzilate (see Chlorobenzilate) | | | | |
| 74851 | Ethylene | 06/91 | | 200. | 7 |
| 106934 | Ethylene dibromide {1,2-Dibromoethane} | | c | 0.5 | 1 3 4 5 6 |
| 107062 | Ethylene dichloride {1,2-Dichloroethane} | | c | 2. | 1 2 3 4 5 |
| 107211 | Ethylene glycol | 06/91 | | 200. | 1 2 |
| 151564 | Ethyleneimine {Aziridine} | 06/91 | | 100. | 1 2 |
| 75218 | Ethylene oxide | | c | 0.5 | 1 2 3 4 5 6 |
| 96457 | Ethylene thiourea | | c | 2. | 1 2 3 4 5 |

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|---|---|---|---|---|---|
| 1101 | Fluorides and compounds | 09/89 | | 100. | 2 |
| | including but not limited to: | | | | |
| 7664393 | Hydrogen fluoride | | | 50. | 1 2 7 |
| 1103 [10] | Fluorocarbons (brominated) | | | 200. | 6 |
| 1104 [10] | Fluorocarbons (chlorinated) | | | 200. | 1 6 |
| | including but not limited to: | | | | |
| 76131 | Chlorinated fluorocarbon {CFC-113} {1,1,2-Trichloro-1,2,2-trifluoroethane} | | | 200. | 1 2 6 |
| 75456 | Chlorodifluoromethane {Freon 22} | 07/96 | | 200. | 1 6 7 |
| 75434 | Dichlorofluoromethane {Freon 12} | 07/96 | | 200. | 1 6 7 |
| 75694 | Trichlorofluoromethane {Freon 11} | 07/96 | | 200. | 1 6 7 |
| 50000 | Formaldehyde | | c | 5. | 1 2 3 4 5 6 |
| 110009 | Furan | 07/96 | c | 5. | 4 |
| - - [9] | Gasoline engine exhaust | 09/90 | c | | 3 |
| | including but not limited to: | | | | |
| - - [9] | Gasoline engine exhaust (condensates & extracts) | 06/91 | c | | 4 |
| 9910 [9] | Gasoline engine exhaust, particulate matter | 09/90 | c | 100. | 3 4 |
| 9911 [9] | Gasoline engine exhaust, total organic gas | 09/90 | c | 100. | 3 4 |
| 1110 [11] | Gasoline vapors | | c | 200. | 1 2 3 4 |
| 111308 | Glutaraldehyde | | | 0.1 | 1 6 |
| 1115 | Glycol ethers and their acetates | | | 100. | 1 2 6 |
| | including but not limited to: | | | | |
| 111466 | Diethylene glycol | 09/90 | | 100. | 1 6 |
| 111966 | Diethylene glycol dimethyl ether | 09/90 | | 100. | 1 2 6 |
| 112345 | Diethylene glycol monobutyl ether | 09/90 | | 100. | 1 2 6 |
| 111900 | Diethylene glycol monoethyl ether | 09/90 | | 100. | 1 2 6 |
| 111773 | Diethylene glycol monomethyl ether | 09/90 | | 100. | 1 2 6 |
| 25265718 | Dipropylene glycol | 09/90 | | 100. | 1 6 |
| 34590948 | Dipropylene glycol monomethyl ether | 09/90 | | 100. | 1 6 |
| 629141 | Ethylene glycol diethyl ether | 09/90 | | 100. | 1 2 6 |
| 110714 | Ethylene glycol dimethyl ether | 09/90 | | 100. | 1 2 6 |
| 111762 | Ethylene glycol monobutyl ether | 09/90 | | 200. | 1 2 6 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110805 | Ethylene glycol monoethyl ether | 09/89 | | 50. | 1 | 2 | | | | 6 | | | | |
| 111159 | Ethylene glycol monoethyl ether acetate | 09/90 | | 100. | 1 | 2 | | | | 6 | | | | |
| 109864 | Ethylene glycol monomethyl ether | 09/89 | | 10. | 1 | 2 | | | | 6 | | | | |
| 110496 | Ethylene glycol monomethyl ether acetate | 09/90 | | 200. | 1 | 2 | | | | 6 | | | | |
| 2807309 | Ethylene glycol monopropyl ether | 09/90 | | 100. | 1 | 2 | | | | 6 | | | | |
| 107982 | Propylene glycol monomethyl ether | 09/90 | | 200. | 1 | | | | | 6 | | | | |
| 108656 | Propylene glycol monomethyl ether acetate | 09/90 | | 100. | 1 | | | | | 6 | | | | |
| 112492 | Triethylene glycol dimethyl ether | 09/90 | | 100. | 1 | 2 | | | | 6 | | | | |
| 76448 | Heptachlor | 09/89 | c | 100. | 1 | 2 | | 4 | | | | | | |
| 118741 | Hexachlorobenzene | | c | 0.1 | 1 | 2 | 3 | | 5 | | | | | |
| 87683 | Hexachlorobutadiene | 06/91 | | 0.1 | 1 | 2 | | | | | | | | |
| 1120 | Hexachlorocyclohexanes(mixed or technical grade) including but not limited to: | | c | 0.05 | 1 | | 3 | 4 | 5 | | | | | |
| 319846 | alpha-Hexachlorocyclohexane | 07/96 | c | 0.1 | 1 | | 3 | 4 | 5 | | 7 | | | |
| 319857 | beta-Hexachlorocyclohexane | 07/96 | c | 0.1 | 1 | | 3 | 4 | 5 | | 7 | | | |
| 58899 | Lindane {gamma-Hexachlorocyclohexane} | 09/90 | c | 0.1 | 1 | 2 | | 4 | | | | | | |

APPENDIX A-I
Substances For Which Emissions Must Be Quantified

| Emittent ID Other (Note [1]) Notes(s) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Applicable Degree of Accuracy (lb/yr) (Note [5]) | Source List(s) (Note [6]) |
|---|---|---|---|---|---|
| 77474 | Hexachlorocyclopentadiene | | | 2. | 1 2 |
| 67721 | Hexachloroethane | 09/90 | c | 200. | 1 2 4 |
| 680319 | Hexamethylphosphoramide | | c | 100. | 1 2 3 4 5 |
| 110543 | Hexane | 06/91 | | 200. | 1 2 |
| 302012 | Hydrazine | | c | 0.01 | 1 2 3 4 5 |
| 7647010 | Hydrochloric acid | | | 20. | 1 2 |
| - | Hydrocyanic acid (see Cyanide compounds) | | | | |
| 7783064 | Hydrogen sulfide | | | 5. | 1 2 |
| 123319 | Hydroquinone | 06/91 | | 100. | 1 2 |
| - | Indeno[1,2,3-cd]pyrene [PAH, POM], (see PAH) | | | | |
| 13463406 | Iron pentacarbonyl | 07/96 | | 5. | 7 |
| 1125 | Isocyanates | | | 0.05 | 6 |
| | including but not limited to: | | | | |
| 822060 | Hexamethylene-1,6-diisocyanate | 06/91 | | 0.05 | 1 2 |
| 101688 | Methylene diphenyl diisocyanate {MDI} [POM] | 06/91 | | 0.1 | 1 2 |
| 624839 | Methyl isocyanate | | | 1. | 1 2 |
| - | Toluene-2,4-diisocyanate (see Toluene diisocyanates) | | | | |
| - | Toluene-2,6-diisocyanate (see Toluene diisocyanates) | | | | |
| 78591 | Isophorone | 06/91 | | 200. | 1 2 |
| 78795 | Isoprene, except from vegetative emission sources | 07/96 | c | 200. | 3 |
| 67630 | Isopropyl alcohol | 06/91 | | 200. | 1 |
| 80057 | 4,4'-Isopropylidenediphenol [POM] | 06/91 | | 100. | 1 2 |
| 7439921 | Lead | | c | 0.5 | 1 4 6 |
| 1128 [7] | Lead compounds (inorganic) | | c | 0.5 | 1 3 |
| | including but not limited to: | | | | |
| 301042 [7] [12] | Lead acetate | | c | 1. | 1 2 4 5 |
| - | Lead chromate (see Chromium, hexavalent) | | | | |
| 7446277 [7] | Lead phosphate | | c | 2. | 1 4 5 |
| 1335326 [7] [12] | Lead subacetate | 09/90 | c | 2. | 1 2 4 |
| 1129 [7] | Lead compounds (other than inorganic) | 06/91 | | 5. | 1 2 |
| 108316 | Maleic anhydride | | | 0.5 | 1 2 |
| 7439965 | Manganese | | | 0.1 | 1 2 |

| | | | | | |
|---|---|---|---|---|---|
| * | Manganese compounds | 09/89 | | 0.1 | 1 2 |
| [7] | | | | | |
| 7439976 | Mercury | | | 1. | 1 2 4 6 |
| * | Mercury compounds | 09/89 | | 1. | 1 2 4 |
| [7] | | | | | |
| | including but not limited to: | | | | |
| 7487947 | Mercuric chloride | | | 1. | 2 |
| [7] | | | | | |
| 593748 | Methyl mercury {Dimethylmercury} | | | 1. | 2 |
| [7] | | | | | |
| 67561 | Methanol | | | 200. | 1 2 |
| 72435 | Methoxychlor [POM] | 06/91 | | 100. | 1 2 |
| 75558 | 2-Methylaziridine {1,2-Propyleneimine} | | c | 100. | 1 2 3 4 |
| 74839 | Methyl bromide {Bromomethane} | | | 20. | 1 2 6 |
| 74873 | Methyl chloride {Chloromethane} | 06/91 | | 20. | 1 2 |
| 71556 | Methyl chloroform {1,1,1-Trichloroethane} | | | 200. | 1 2 6 |
| 56495 | 3-Methylcholanthrene [PAH-Derivative, POM] | 09/90 | c | 0.001 | 1 2 4 |
| 3697243 | 5-Methylchrysene [PAH-Derivative, POM] | | c | 0.05 | 1 2 3 4 5 |

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Substances For Which Emissions Must Be Quantified

| Emittent ID Other (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Applicable Degree of Accuracy (lb/yr) (Note [5]) | Source List(s) (Note [6]) | Notes(s) |
|---|---|---|---|---|---|---|
| 101144 | 4,4'-Methylene bis(2-chloroaniline) {MOCA} [POM] | | c | 0.1 | 1 2 3 4 5 | |
| 75092 | Methylene chloride {Dichloromethane} | | c | 50. | 1 2 3 4 5 6 | |
| 101779 | 4,4'-Methylenedianiline (and its dichloride) [POM] | | c | 0.1 | 1 2 3 4 5 | |
| 78933 | Methyl ethyl ketone {2-Butanone} | 06/91 | | 200. | 1 2 | |
| 60344 | Methyl hydrazine | 06/91 | | 100. | 1 2 | |
| 74884 | Methyl iodide {Iodomethane} | | c | 100. | 1 2 4 5 | |
| 108101 | Methyl isobutyl ketone {Hexone} | 06/91 | | 20. | 1 2 | |
| 75865 | 2-Methyllactonitrile {Acetone cyanohydrin} | 07/96 | | 50. | 7 | |
| 80626 | Methyl methacrylate | | | 200. | 1 2 6 | |
| 109068 | 2-Methylpyridine | 07/96 | | 100. | 7 | |
| 1634044 | Methyl tert-butyl ether | 06/91 | | 200. | 1 2 | |
| 90948 | Michler's ketone [POM] | | c | 0.1 | 1 2 4 5 | |
| 1136 | Mineral fibers (fine, manmade) (fine mineral fibers which are manmade and are airborne particles of a respirable size greater than 5 microns in length, less than or equal to 3.5 microns in diameter, with a length to diameter ratio of 3:1) | 06/91 | c | 100. | 1 2 7 | |
| | including but not limited to: | | | | | |
| 1056 | Ceramic fibers | 09/89 | c | 100. | 1 2 3 4 | |
| 1111 | Glasswool fibers | 09/89 | c | 100. | 1 2 3 4 | |
| 1168 | Rockwool fibers | 09/89 | c | 100. | 1 2 3 | |
| 1181 | Slagwool fibers | 09/89 | c | 100. | 1 2 3 | |
| 1135 | Mineral fibers (other than manmade) | | | 100. | 2 7 | |
| | including but not limited to: | | | | | |
| 1332214 | Asbestos | | c | 0.0001 | 1 2 3 4 5 | |
| 12510428 | Erionite | | c | 100. | 2 3 4 | |
| 1190 | Talc containing asbestiform fibers | | c | 100. | 2 3 4 | |
| 1313275 | Molybdenum trioxide | 06/91 | | 100. | 1 | |
| - | Naphthalene [PAH, POM], (see PAH) | | | | | |
| 7440020 | Nickel | | c | 0.1 | 1 2 3 4 5 | |
| * | Nickel compounds | | c | 1. | 1 2 3 4 5 | [7] |
| | including but not limited to: | | | | | |
| 373024 | Nickel acetate | 06/91 | c | 0.1 | 1 2 5 | [7] |
| 3333393 | Nickel carbonate | 06/91 | c | 0.1 | 1 2 5 | [7] |
| 13463393 | Nickel carbonyl | | c | 0.1 | 1 2 4 5 | [7] |

| | | | | | |
|---|---|---|---|---|---|
| 12054487 | Nickel hydroxide | 06/91 | c | 0.1 | 1 2 5 [7] |
| 1271289 | Nickelocene | 06/91 | c | 0.1 | 1 2 5 [7] |
| 1313991 | Nickel oxide | 06/91 | c | 0.1 | 1 2 5 [7] |
| 12035722 | Nickel subsulfide | | c | 0.1 | 1 2 4 5 [7] |
| 1146 | Nickel refinery dust from the pyrometallurgical process | 09/89 | c | 0.1 | 4 |
| 7697372 | Nitric acid | 06/91 | | 50. | 1 |
| 139139 | Nitrilotriacetic acid | | c | 100. | 1 4 5 |
| 98953 | Nitrobenzene | | | 0.5 | 1 2 |
| 92933 | 4-Nitrobiphenyl [POM] | 09/89 | c | 100. | 1 2 4 |
| 7496028 | 6-Nitrochrysene [PAH-Derivative, POM] | 06/91 | c | 0.001 | 1 2 3 4 |
| 607578 | 2-Nitrofluorene [PAH-Derivative, POM] | 06/91 | c | 5. | 1 2 3 4 |

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| Emittent ID Other (Note [1]) Notes(s) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Applicable Degree of Accuracy (lb/yr) (Note [5]) | Source List(s) (Note [6]) |
|---|---|---|---|---|---|
| 302705 | Nitrogen mustard N-oxide | | c | 0.05 | 3 4 |
| 100027 | 4-Nitrophenol | 06/91 | | 100. | 1 2 |
| 79469 | 2-Nitropropane | | c | 0.01 | 1 2 3 4 5 |
| 5522430 | 1-Nitropyrene [PAH-Derivative, POM] | 06/91 | c | 0.5 | 1 2 3 4 |
| 156105 | p-Nitrosodiphenylamine [POM] | | c | 5. | 1 2 4 5 |
| 684935 | N-Nitroso-N-methylurea | | c | 100. | 1 2 4 5 |
| 59892 | N-Nitrosomorpholine | | c | 0.01 | 1 2 3 4 5 |
| 100754 | N-Nitrosopiperidine | | c | 200. | 3 4 5 |
| 930552 | N-Nitrosopyrrolidine | | c | 0.05 | 3 4 5 |
| - - [13] | PAHs (Polycyclic aromatic hydrocarbons) [POM] | | | | 1 2 |
| | including but not limited to: | | | | |
| 1151 | PAHs, total, w/o individ. components reported | | | 50. | 1 2 |
| 1150 | PAHs, total, with individ. components also reported | | | 50. | 1 2 |
| 83329 | Acenaphthene [PAH, POM] | 07/96 | | 50. | 1 |
| 208968 | Acenaphthylene [PAH, POM] | 07/96 | | 50. | 1 |
| 120127 | Anthracene [PAH, POM] | 06/91 | | 50. | 1 2 7 |
| 56553 | Benz[a]anthracene [PAH, POM] | | c | 0.5 | 1 2 3 4 5 |
| 50328 | Benzo[a]pyrene [PAH, POM] | | c | 0.05 | 1 2 3 4 5 |
| 205992 | Benzo[b]fluoranthene [PAH, POM] | | c | 0.5 | 1 2 3 4 5 |
| 192972 | Benzo[e]pyrene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 191242 | Benzo[g,h,i]perylene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 205823 | Benzo[j]fluoranthene [PAH, POM] | | c | 0.5 | 1 2 3 4 5 |
| 207089 | Benzo[k]fluoranthene [PAH, POM] | | c | 0.5 | 1 2 3 4 5 |
| 218019 | Chrysene [PAH, POM] | 09/90 | c | 5. | 1 2 4 |
| 53703 | Dibenz[a,h]anthracene [PAH, POM] | | c | 0.1 | 1 2 3 4 5 |
| 192654 | Dibenzo[a,e]pyrene [PAH, POM] | | c | 0.05 | 1 2 3 4 5 |
| 189640 | Dibenzo[a,h]pyrene [PAH, POM] | | c | 0.001 | 1 2 3 4 5 |
| 189559 | Dibenzo[a,i]pyrene [PAH, POM] | | c | 0.001 | 1 2 3 4 5 |
| 191300 | Dibenzo[a,l]pyrene [PAH, POM] | | c | 0.001 | 1 2 3 4 5 |
| 206440 | Fluoranthene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 86737 | Fluorene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 193395 | Indeno[1,2,3-cd]pyrene [PAH, POM] | | c | 0.5 | 1 2 3 4 5 |
| 91576 | 2-Methyl naphthalene [PAH, POM] | 07/96 | | 50. | 1 |
| 91203 | Naphthalene [PAH, POM] | | | 50. | 1 2 |
| 198550 | Perylene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 85018 | Phenanthrene [PAH, POM] | 07/96 | | 0.5 | 1 |
| 129000 | Pyrene [PAH, POM] | 07/96 | | 0.5 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| # | PAH-Derivatives (Polycyclic aromatic hydrocarbon derivatives) [POM] (including but not limited to those substances listed in Appendix A with the bracketed designation [PAH-Derivative, POM]) [14] | 06/91 | | | |
| 56382 | Parathion | 06/91 | | 100. | 1 2 |
| 1336363 | PCBs (Polychlorinated biphenyls) [POM] | | c | 0.01 | 1 2 3 4 5 6 |
| 82688 | Pentachloronitrobenzene {Quintobenzene} | 06/91 | | 100. | 1 2 |
| 79210 | Peracetic acid | 06/91 | | 100. | 1 |
| 127184 | Perchloroethylene {Tetrachloroethene} | | c | 5. | 1 2 3 4 5 6 |

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|---|---|---|---|---|---|
| 108952 | Phenol | | | 200. | 1 2 |
| 106503 | p-Phenylenediamine | 06/91 | | 100. | 1 2 |
| 90437 | 2-Phenylphenol [POM] | 06/91 | | 100. | 1 2 |
| 75445 | Phosgene | | | 2. | 1 2 |
| 7723140 | Phosphorus | | | 0.1 | 1 2 |
| - - | Phosphorus compounds: | 09/89 | | | 2 |
| 7803512 | Phosphine | | | 0.01 | 1 2 7 |
| 7664382 | Phosphoric acid | 09/89 | | 50. | 1 2 |
| 10025873 | Phosphorus oxychloride | 09/89 | | 0.1 | 2 |
| 10026138 | Phosphorus pentachloride | 09/89 | | 0.1 | 2 |
| 1314563 | Phosphorus pentoxide | 09/89 | | 0.1 | 2 |
| 7719122 | Phosphorus trichloride | 09/89 | | 0.1 | 2 |
| 126738 | Tributyl phosphate | 09/89 | | 100. | 2 |
| 78400 | Triethyl phosphine | 09/89 | | 100. | 2 |
| 512561 | Trimethyl phosphate | 09/89 | | 100. | 2 |
| 78308 | Triorthocresyl phosphate [POM] | 09/89 | | 0.5 | 1 2 |
| 115866 | Triphenyl phosphate [POM] | 09/89 | | 100. | 1 2 |
| 101020 | Triphenyl phosphite [POM] | 09/89 | | 100. | 1 2 |
| 85449 | Phthalic anhydride | | | 0.01 | 1 2 |
| - - | Polychlorinated dibenzo-p-dioxins {PCDDs or Dioxins} [POM] including but not limited to: | | c | | 1 2 |
| 1086 | Dioxins, total, w/o individ. isomers reported {PCDDs} | | c | 0.00002 | 1 2 |
| 1085 | Dioxins, total, with individ. isomers also reported {PCDDs} | | c | 0.00002 | 1 2 |
| 1746016 | 2,3,7,8-Tetrachlorodibenzo-p-dioxin {TCDD} [POM] | | c | 0.000001 | 1 2 3 4 5 |
| 40321764 | 1,2,3,7,8-Pentachlorodibenzo-p-dioxin [POM] | | c | 0.000001 | 1 2 |
| 39227286 | 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin [POM] | | c | 0.000001 | 1 2 4 |
| 57653857 | 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin [POM] | | c | 0.000001 | 1 2 |
| 19408743 | 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin [POM] | | c | 0.000001 | 1 2 |
| 35822469 | 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin [POM] | | c | 0.000001 | 1 2 |
| 3268879 | 1,2,3,4,5,6,7,8-Octachlorodibenzo-p-dioxin [POM] | 07/96 | c | 0.000001 | 1 2 |
| 41903575 | Total Tetrachlorodibenzo-p-dioxin [POM] | 07/96 | c | 0.000001 | 1 2 |
| 36088229 | Total Pentachlorodibenzo-p-dioxin [POM] | 07/96 | c | 0.000001 | 1 2 |
| 34465468 | Total Hexachlorodibenzo-p-dioxin [POM] | 07/96 | c | 0.000001 | 1 2 |
| 37871004 | Total Heptachlorodibenzo-p-dioxin [POM] | 07/96 | c | 0.000001 | 1 2 |

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|---|---|---|---|---|---|---|
| - - | Polychlorinated dibenzofurans {PCDFs or Dibenzofurans} [POM] including but not limited to: | | c | | 1 2 | |
| 1080 | Dibenzofurans (Polychlorinated dibenzofurans) {PCDFs} [POM] | | c | 0.00002 | 1 2 | |
| 51207319 | 2,3,7,8-Tetrachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 57117416 | 1,2,3,7,8-Pentachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 57117314 | 2,3,4,7,8-Pentachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 70648269 | 1,2,3,4,7,8-Hexachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 57117449 | 1,2,3,6,7,8-Hexachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 72918219 | 1,2,3,7,8,9-Hexachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 60851345 | 2,3,4,6,7,8-Hexachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 67562394 | 1,2,3,4,6,7,8-Heptachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 55673897 | 1,2,3,4,7,8,9-Heptachlorodibenzofuran [POM] | | c | 0.000001 | 1 2 | |
| 39001020 | 1,2,3,4,5,6,7,8-Octachlorodibenzofuran [POM] | 07/96 | c | 0.000001 | 1 2 | |
| 55722275 | Total Tetrachlorodibenzofuran [POM] | 07/96 | c | 0.000001 | 1 2 | |
| 30402154 | Total Pentachlorodibenzofuran [POM] | 07/96 | c | 0.000001 | 1 2 | |
| 55684941 | Total Hexachlorodibenzofuran [POM] | 07/96 | c | 0.000001 | 1 2 | |
| 38998753 | Total Heptachlorodibenzofuran [POM] | 07/96 | c | 0.000001 | 1 2 | |
| # | POM (Polycyclic organic matter) (including but not limited to those substances listed in Appendix A with the bracketed designation of [POM], [PAH, POM], or [PAH-Derivative, POM]) | 09/89 | | | 1 2 | [15] |
| 1120714 | 1,3-Propane sultone | | c | 0.05 | 1 2 3 4 5 | |
| 57578 | beta-Propiolactone | | c | 10. | 1 2 3 4 5 | |
| 123386 | Propionaldehyde | 06/91 | | 200. | 1 2 | |
| 114261 | Propoxur {Baygon} | 06/91 | | 100. | 1 2 | |
| 115071 | Propylene | | | 200. | 1 2 | |
| 75569 | Propylene oxide | | c | 10. | 1 2 3 4 5 | |
| - | 1,2-Propyleneimine (see 2-Methylaziridine) | | | | | |
| 110861 | Pyridine | 06/91 | | 100. | | 7 |
| 91225 | Quinoline | 06/91 | | 100. | 1 2 | |
| 106514 | Quinone | 06/91 | | 100. | 1 2 | |
| 1165 | Radionuclides including but not limited to: | | c | 100. | 1 2 4 | [16] |
| 24267569 | Iodine-131 | 09/89 | c | 100. | 1 2 4 | |
| 1166 | Radon and its decay products | 09/89 | c | 100. | 1 4 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50555 | Reserpine [POM] | | c | 100. | 1 | 2 | | 4 | 5 | | |
| # | Residual (heavy) fuel oils | 06/91 | c | | | | | | | | |
| 7782492 | Selenium | | | 0.5 | | 2 | | | | | |
| * | Selenium compounds | | | 0.5 | 1 | 2 | | | | | |
| [7] | | | | | | | | | | | |
| | including but not limited to: | | | | | | | | | | |
| 7446346 | Selenium sulfide | 09/90 | c | 0.1 | | 2 | | 4 | 5 | | |
| [7] | | | | | | | | | | | |
| 1175 | Silica, crystalline | | c | 0.1 | 1 | | 3 | 4 | | | |
| 7440224 | Silver | 06/91 | | 2. | | | | | | | 7 |
| * | Silver compounds | 06/91 | | 2. | 1 | | | | | | |
| [7] | | | | | | | | | | | |

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|---|---|---|---|---|---|
| 1310732 | Sodium hydroxide | | | 2. | 1 2 |
| 100425 | Styrene | | c | 100. | 1 2 3 6 |
| 96093 | Styrene oxide | | c | 100. | 1 2 3 4 |
| 7664939 | Sulfuric acid | 06/91 | | 2. | 1 |
| 100210 | Terephthalic acid | 06/91 | | 100. | 1 |
| 79345 | 1,1,2,2-Tetrachloroethane | 09/90 | c | 1. | 1 2 4 |
| 7440280 | Thallium | 06/91 | | 100. | 7 |
| * | Thallium compounds | 06/91 | | 100. | 7 |
| [7] | | | | | |
| 62555 | Thioacetamide | | c | 0.01 | 3 4 5 |
| 62566 | Thiourea | | c | 0.1 | 1 3 4 5 |
| 7550450 | Titanium tetrachloride | 06/91 | | 100. | 1 2 |
| 108883 | Toluene | | | 200. | 1 2 4 6 |
| - | 2,4-Toluenediamine (see 2,4-Diaminotoluene) | | | | |
| 1204 | Toluene diisocyanates including but not limited to: | 06/91 | c | 0.1 | 1 3 |
| 584849 | Toluene-2,4-diisocyanate | | c | 0.1 | 1 2 3 5 |
| 91087 | Toluene-2,6-diisocyanate | | c | 0.1 | 1 2 3 5 |
| 95534 | o-Toluidine | | c | 10. | 1 2 3 4 5 |
| 8001352 | Toxaphene {Polychlorinated camphenes} | | c | 100. | 1 2 3 4 5 |
| 79005 | 1,1,2-Trichloroethane {Vinyl trichloride} | 06/91 | c | 50. | 1 2 4 |
| - | 1,1,1-Trichloroethane (see Methyl chloroform) | | | | |
| 79016 | Trichloroethylene | | c | 20. | 1 2 4 |
| - | 2,4,6-Trichlorophenol (see Chlorophenols) | | | | |
| 96184 | 1,2,3-Trichloropropane | 07/96 | c | 200. | 3 4 7 |
| 121448 | Triethylamine | 06/91 | | 20. | 1 2 |
| 1582098 | Trifluralin | 06/91 | | 100. | 1 2 |
| 95636 | 1,2,4-Trimethylbenzene | 06/91 | | 5. | 1 |
| 540841 | 2,2,4-Trimethylpentane | 06/91 | | 100. | 1 2 |
| 51796 | Urethane {Ethyl carbamate} | | c | 0.1 | 1 2 3 4 5 |
| 7440622 | Vanadium (fume or dust) | 06/91 | | 10. | 7 |
| [17] | | | | | |
| 108054 | Vinyl acetate | 06/91 | | 200. | 1 2 |
| 593602 | Vinyl bromide | | c | 20. | 1 2 3 4 |
| 75014 | Vinyl chloride | | c | 0.5 | 1 2 3 4 5 |
| 100403 | 4-Vinylcyclohexene | 07/96 | c | 5. | 3 |
| 75025 | Vinyl fluoride | 07/96 | c | 200. | 3 |
| 75354 | Vinylidene chloride | | | 20. | 1 2 |
| 1206 | Wood preservatives (containing arsenic and chromate) | 09/89 | | 100. | 6 |

| | | | | | |
|---|---|---|---|---|---|
| 1210 | Xylenes (mixed xylenes) | | 200. | 1 2 | 6 |
| | including: | | | | |
| 108383 | m-Xylene | 06/91 | 200. | 1 2 | |
| 95476 | o-Xylene | 06/91 | 200. | 1 2 | |
| 106423 | p-Xylene | 06/91 | 200. | 1 2 | |
| 7440666 | Zinc | | 2. | 2 | |
| * | Zinc compounds | 09/89 | 2. | 1 2 | |
| [7] | | | | | |
| | including but not limited to: | | | | |
| 1314132 | Zinc oxide | | 2. | 2 | |
| [7] | | | | | |

# Appendix A-II

## Substances For Which Production, Use,

## Or Other Presence Must Be Reported

## July 1, 1997

APPENDIX A-II
Substances For Which Production, Use, Or Other Presence Must Be Reported

| Emittent ID (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Source List(s) (Note [6]) | Other Notes(s) |
|---|---|---|---|---|---|
| 26148685 | A-alpha-C {2-Amino-9H-pyrido[2,3-b]indole} | 09/89 | c | 3 4 | [18] |
| 34256821 | Acetochlor | 09/89 | c | 4 | |
| 62476599 | Acifluorfen [POM] | 09/90 | c | 1 2 4 | |
| 3688537 | AF-2 | | c | 3 4 | |
| 1000 | Aflatoxins | | c | 3 4 5 | |
| 15972608 | Alachlor | 09/89 | c | 4 | |
| 309002 | Aldrin | 09/89 | c | 4 | |
| 107186 | Allyl alcohol | 06/91 | | 7 | |
| 60093 | p-Aminoazobenzene {4-Aminoazobenzene} [POM] | | c | 1 2 3 4 | |
| 97563 | o-Aminoazotoluene [POM] | | c | 1 2 3 4 5 | |
| 6109973 | 3-Amino-9-ethylcarbazole hydrochloride [POM] | 09/89 | c | 1 2 4 5 | |
| 125848 | Aminoglutethimide | 09/90 | | 4 | |
| 82280 | 1-Amino-2-methylanthraquinone [PAH-Derivative, POM] | | c | 1 2 4 5 | |
| 68006837 | 2-Amino-3-methyl-9H-pyrido(2,3-b) indole {MeA-alpha-C} | 09/89 | c | 3 4 | |
| 712685 | 2-Amino-5-(5-nitro-2-furyl)-1,3,4-thiadiazole | | c | 3 4 | |
| - | 2-Amino-9H-pyrido(2,3-b)indole (see A-alpha-C) | | | | |
| 134292 | o-Anisidine hydrochloride | | c | 4 5 | |
| 104949 | p-Anisidine | 06/91 | | 7 | |
| 140578 | Aramite | | c | 3 4 | |
| 492808 | Auramine [POM] | | c | 1 2 3 4 5 | |
| 446866 | Azathioprine | | c | 3 4 5 | |
| 103333 | Azobenzene [POM] | 09/90 | c | 1 2 4 | |
| 98873 | Benzal chloride | 06/91 | | 7 | |
| 55210 | Benzamide | 06/91 | | 7 | |
| 1694093 | Benzyl violet 4B [POM] | | c | 1 2 3 4 | |
| 1025 | Betel quid with tobacco | | c | 3 4 | |
| 494031 | N-N-Bis(2-chloroethyl)-2-naphthylamine {Chlornaphazine} [PAH-Derivative, POM] | | c | 1 2 3 4 5 | |
| 108601 | Bis(2-chloro-1-methylethyl) ether | 06/91 | | 7 | |
| 1030 | Bitumens, extracts of steam-refined and air-refined bitumens | | c | 3 4 | |
| 1035 | Bleomycins | | c | 3 | |
| 75274 | Bromodichloromethane | 09/90 | c | 4 | |
| 1689845 | Bromoxynil | 06/91 | | 4 | |
| 25013165 | Butylated hydroxyanisole {BHA} | | c | 3 4 | |
| 123728 | Butyraldehyde | 06/91 | | 7 | |
| 3068880 | beta-Butyrolactone | | c | 3 4 | |
| 630080 | Carbon monoxide | 09/89 | | 4 | |
| 143500 | Chlordecone {Kepone} | | c | 3 4 | |
| 6164983 | Chlordimeform | 09/89 | c | 4 | |
| 115286 | Chlorendic acid | 09/89 | c | 3 4 5 | |
| 124481 | Chlorodibromomethane | 09/90 | c | 4 | |

| | | | | | |
|---|---|---|---|---|---|
| 563473 | 3-Chloro-2-methylpropene | 09/89 | c | | 4 5 |
| 1065 | Chlorophenoxy herbicides | | c | 3 | |
| 1897456 | Chlorothalonil | 09/89 | c | | 4 |
| 1059 | p-Chloro-o-toluidine (strong acid salts) | 06/91 | c | 3 | |

APPENDIX A-II
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| Emittent ID (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Source List(s) (Note [6]) | Other Notes(s) |
|---|---|---|---|---|---|
| 4680788 | C. I. Acid Green 3 [POM] | 06/91 | | 1 2 7 | |
| 569642 | C. I. Basic Green 4 [POM] | 06/91 | | 1 2 7 | |
| 989388 | C. I. Basic Red 1 [POM] | 06/91 | | 1 2 7 | |
| 569619 | C. I. Basic Red 9 monohydrochloride [POM] | 09/89 | c | 1 2 4 5 | |
| 2832408 | C. I. Disperse Yellow 3 [POM] (NOTE: "C. I." means "color index") | 06/91 | | 1 2 7 | |
| 87296 | Cinnamyl anthranilate [POM] | 09/89 | c | 1 2 4 5 | |
| 6358538 | Citrus Red No. 2 [POM] | | c | 1 2 3 4 | |
| 8007452 | Coal tars | 09/89 | c | 3 4 5 | |
| 21725462 | Cyanazine | 09/90 | | 4 | |
| 14901087 | Cycasin | | c | 3 4 | |
| 13121705 | Cyhexatin | 09/89 | | 4 | |
| 3468631 | D and C Orange No. 17 [PAH-Derivative, POM] | 09/90 | c | 1 2 4 | |
| 81889 | D and C Red No. 19 [POM] | 09/90 | c | 1 2 4 | |
| 2092560 | D and C Red No. 8 [PAH-Derivative, POM] | 06/91 | c | 1 2 4 | |
| 5160021 | D and C Red No. 9 [PAH-Derivative, POM] | 09/90 | c | 1 2 4 | |
| 1596845 | Daminozide | 09/90 | c | 4 | |
| 50293 | DDT {1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane} [POM] | | c | 1 2 3 4 5 | |
| 613354 | N,N'-Diacetylbenzidine [POM] | | c | 1 2 3 4 | |
| 2303164 | Diallate | 06/91 | | 7 | |
| 39156417 | 2,4-Diaminoanisole sulfate | | c | 4 5 | |
| 101804 | 4,4'-Diaminodiphenyl ether [POM] | | c | 1 2 3 4 5 | |
| 764410 | 1,4-Dichloro-2-butene | 09/90 | c | 4 | |
| 28434868 | 3,3'-Dichloro-4,4'-diaminodiphenyl ether [POM] | 09/89 | c | 1 2 3 4 | |
| 72548 | Dichlorodiphenyldichloroethane {DDD} [POM] | 09/89 | c | 1 2 4 | |
| 540590 | 1,2-Dichloroethylene | 06/91 | | 7 | |
| 78886 | 2,3-Dichloropropene | 06/91 | | 7 | |
| 60571 | Dieldrin | 09/89 | c | 4 | |
| 1464535 | Diepoxybutane | | c | 3 4 5 | |
| 1615801 | 1,2-Diethylhydrazine | | c | 3 4 | |
| 84662 | Diethyl phthalate | 06/91 | | 7 | |
| 101906 | Diglycidyl resorcinol ether {DGRE} | | c | 3 4 5 | |
| 94586 | Dihydrosafrole | | c | 3 4 | |
| 20325400 | 3,3'-Dimethoxybenzidine dihydrochloride [POM] | 06/91 | c | 1 2 4 | |
| 55738540 | trans-2-[(Dimethylamino)methylimino]-5-[2-(5-nitro-2-furyl)vinyl-1,3,4-oxadiazol | | c | 3 4 | |
| 540738 | 1,2-Dimethylhydrazine | | c | 3 4 | |
| 105679 | 2,4-Dimethylphenol {2,4-Xylenol} | 06/91 | | 7 | |
| 513371 | Dimethylvinylchloride {DMVC} | 09/89 | c | 4 5 | |
| 25154545 | Dinitrobenzenes (mixtures of) including: | 09/90 | | 4 7 | |
| 99650 | m-Dinitrobenzene | 06/91 | | 7 | |
| 528290 | o-Dinitrobenzene | 06/91 | | 7 | |

| | | | | |
|---|---|---|---|---|
| 100254 | p-Dinitrobenzene | 06/91 | | 7 |
| 39300453 | Dinocap | 09/90 | 4 | |
| 88857 | Dinoseb | 09/89 | 4 | |
| 117840 | n-Dioctyl phthalate | 06/91 | | 7 |

APPENDIX A-II
Substances For Which Production, Use, Or Other Presence Must Be Reported

| Emittent ID (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Source List(s) (Note [6]) | Other Notes(s) |
|---|---|---|---|---|---|
| 2475458 | Disperse Blue 1 [PAH-Derivative, POM] | 06/91 | c | 1 2 3 4 | |
| 541413 | Ethyl chloroformate | 06/91 | | 7 | |
| 62500 | Ethyl methanesulfonate | | c | 3 4 | |
| 2164172 | Fluometuron | 06/91 | | 7 | |
| 133073 | Folpet | 09/89 | c | 4 | |
| 3570750 | 2-(2-Formylhydrazino)-4-(5-nitro-2-furyl)thiazole | | c | 3 4 | |
| 60568050 | Furmecyclox | 09/90 | c | 4 | |
| 67730114 | Glu-P-1 {2-Amino-6-methyldipyrido[1,2-a:3',2'-d]imidazole} | | c | 3 4 | |
| 67730103 | Glu-P-2 {2-Aminodipyrido[1,2-a:3',2'-d]imidazole} | | c | 3 4 | |
| 765344 | Glycidaldehyde | | c | 3 4 | |
| 556525 | Glycidol | 09/90 | c | 4 | |
| 16568028 | Gyromitrin {Acetaldehyde methylformylhydrazone} | | c | 4 | |
| 2784943 | HC Blue 1 | 09/89 | c | 4 5 | |
| 1024573 | Heptachlor epoxide | 09/89 | c | 4 | |
| 1335871 | Hexachloronaphthalene [PAH-Derivative, POM] | 06/91 | | 1 2 7 | |
| 10034932 | Hydrazine sulfate | | c | 4 5 | |
| 76180966 | IQ {2-Amino-3-methylimidazo[4,5-f]quinoline} | | c | 3 4 | |
| 78842 | Isobutyraldehyde | 06/91 | | 7 | |
| 120581 | Isosafrole | 09/90 | c | 4 | |
| 4759482 | Isotretinoin | | | 4 | |
| 77501634 | Lactofen [POM] | 09/89 | c | 1 2 4 | |
| 1131 | Lubricant base oils and derived products, specifically vacuum distillates, acid treated oils, aromatic oils, mildly solvent-refined oils, mildly hydrotreated-oils and used engine oils. | 09/89 | c | 3 4 5 | |
| 8018017 | Mancozeb | 09/90 | c | 4 | |
| 12427382 | Maneb | 09/90 | c | 4 | |
| 59052 | Methotrexate | 09/89 | | 4 | |
| 96333 | Methyl acrylate | 06/91 | | 7 | |
| 590965 | Methylazoxymethanol | 09/90 | c | 4 | |
| 592621 | Methylazoxymethanol acetate | 09/89 | c | 3 4 | |
| 101611 | 4,4'-Methylene bis (N,N-dimethyl) benzenamine [POM] | | c | 1 2 4 5 | |
| 838880 | 4,4'-Methylene bis(2-methylaniline) [POM] | 09/89 | c | 1 2 3 4 | |
| 74953 | Methylene bromide | 06/91 | | 7 | |
| 66273 | Methyl methanesulfonate | | c | 3 4 | |
| 129157 | 2-Methyl-1-nitroanthraquinone (uncertain purity) [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 70257 | N-Methyl-N'-nitro-N-nitrosoguanidine | | c | 3 4 | |
| - | N-Methyl-N-nitrosourethane (see N-Nitroso-N-methylurethane) | | | | |
| 924425 | N-Methyloacrylamide | 09/90 | c | 4 | |

| | | | | | |
|---|---|---|---|---|---|
| 9006422 | Metiram | 09/90 | | | 4 |
| 1140 | Mineral oils (untreated and mildly treated oils; and those used in occupations such as mulespinning, metal machining, and jute processing). | | c | 3 | 4 5 |

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|---|---|---|---|---|---|
| 2385855 | Mirex | | c | 3 4 5 | |
| 315220 | Monocrotaline | | c | 3 4 | |
| 505602 | Mustard gas {Sulfur mustard} | | c | 3 4 5 | |
| 134327 | 1-Naphthylamine [PAH-Derivative, POM] | 09/90 | c | 1 2 4 | |
| 91598 | 2-Naphthylamine [PAH-Derivative, POM] | | c | 1 2 3 4 5 | |
| 54115 | Nicotine | 09/90 | | 4 | |
| 1148 | Nitrilotriacetic acid (salts) including but not limited to: | 06/91 | c | 3 | |
| 18662538 | Nitrilotriacetic acid, trisodium salt monohydrate | 06/91 | c | 4 | |
| 602879 | 5-Nitroacenaphthene [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 99592 | 5-Nitro-o-anisidine | | c | 4 5 | |
| 1836755 | Nitrofen (technical grade) | | c | 3 4 5 | |
| 51752 | Nitrogen mustard {Mechlorethamine} | | c | 3 4 5 | |
| 55867 | Nitrogen mustard hydrochloride | 09/89 | c | 4 5 | |
| 55630 | Nitroglycerin | 06/91 | | | 7 |
| 88755 | 2-Nitrophenol | 06/91 | | | 7 |
| 57835924 | 4-Nitropyrene [PAH-Derivative, POM] | 06/91 | c | 1 2 3 4 | |
| 86306 | N-Nitrosodiphenylamine [POM] | 09/89 | c | 1 2 4 | |
| 759739 | N-Nitroso-N-ethylurea | | c | 4 5 | |
| 60153493 | 3-(N-Nitrosomethylamino)propionitrile | 09/89 | c | 3 4 | |
| 64091914 | 4-(N-Nitrosomethylamino)-1-(3-pyridyl)-1-butanone {NNK} | 09/89 | c | 3 4 | |
| 615532 | N-Nitroso-N-methylurethane {N-Methyl-N-nitrosourethane} | | c | 3 4 | |
| 4549400 | N-Nitrosomethylvinylamine | | c | 3 4 5 | |
| 16543558 | N-Nitrosonornicotine | | c | 3 4 5 | |
| 13256229 | N-Nitrososarcosine | | c | 3 4 5 | |
| 303479 | Ochratoxin A [POM] | 09/90 | c | 1 2 4 | |
| 2234131 | Octachloronaphthalene [PAH-Derivative, POM] | 06/91 | | 1 2 | 7 |
| 2646175 | Oil Orange SS [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 20816120 | Osmium tetroxide | 06/91 | | | 7 |
| 794934 | Panfuran S {Dihydroxymethylfuratrizine} | | c | 3 4 | |
| 122601 | Phenyl glycidyl ether | 09/90 | c | 3 4 | |
| 57410 | Phenytoin [POM] | | c | 1 2 3 4 5 | |
| 88891 | Picric acid | 06/91 | | | 7 |
| 1155 | Polybrominated biphenyls {PBBs} [POM] | | c | 1 2 3 4 5 | |
| 53973981 | Polygeenan | 09/89 | c | 4 | |
| 3761533 | Ponceau MX [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 3564098 | Ponceau 3R [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 36791045 | Ribavirin | 09/90 | | 4 | |
| 94597 | Safrole | | c | 3 4 5 | |
| 1180 | Shale oils | | c | 3 4 | |
| 132274 | Sodium o-phenylphenate [POM] | | c | 1 2 3 4 | |

| | | | | | |
|---|---|---|---|---|---|
| 128449 | Sodium saccharin | 09/89 | c | | 4 |
| 1185 | Soots | | c | 3 | 4 |
| 10048132 | Sterigmatocystin [POM] | | c | 1 2 3 | 4 |

APPENDIX A-II

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|---|---|---|---|---|---|
| 95067 | Sulfallate | | c | 3 4 5 | |
| 5216251 | p-alpha,alpha,alpha-Tetrachlorotoluene | 09/90 | c | 4 | |
| 961115 | Tetrachlorvinphos | 06/91 | | 7 | |
| 509148 | Tetranitromethane | 09/90 | c | 4 | |
| 139651 | 4,4'-Thiodianiline [POM] | | c | 1 2 3 4 | |
| 1314201 | Thorium dioxide | | c | 4 5 | |
| 1200 | Tobacco products, smokeless | | c | 3 4 | |
| 1205 | alpha-chlorinated Toluenes | | c | 3 | |
| 636215 | o-Toluidine hydrochloride | | c | 4 5 | |
| 106490 | p-Toluidine | 09/90 | c | 4 | |
| 52686 | Trichlorfon | 06/91 | | 7 | |
| 68768 | Tris(aziridinyl)-p-benzoquinone {Triaziquone} | 09/90 | c | 4 | |
| 52244 | Tris(1-aziridinyl) phosphine sulfide {Thiotepa} | | c | 3 4 5 | |
| 126727 | Tris(2,3-dibromopropyl)phosphate | 09/89 | c | 4 | |
| 62450060 | Trp-P-1 {3-Amino-1,4-dimethyl-5H-pyrido[4,3-b]indole} | | c | 3 4 | |
| 62450071 | Trp-P-2 {3-Amino-1-methyl-5H-pyrido[4,3-b]indole} | | c | 3 4 | |
| 72571 | Trypan blue [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 106876 | 4-Vinyl-1-cyclohexene diepoxide {Vinyl cyclohexene dioxide} | 09/90 | c | 4 | |
| 81812 | Warfarin [POM] | | | 1 2 4 | |
| 87627 | 2,6-Xylidene | 06/91 | | 4 | |
| 12122677 | Zineb | 09/90 | c | 4 | |

# Appendix A-III

## Substances Which Need Not Be Reported

## Unless Manufactured By The Facility

## July 1, 1997

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. September 2002.

APPENDIX A-III
Substances Which Need Not Be Reported Unless Manufactured By the Facility

| Emittent ID (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Source List(s) (Note [6]) | Other Notes(s) |
|---|---|---|---|---|---|
| 546883 | Acetohydroxamic acid | 09/90 | | 4 | |
| 50760 | Actinomycin D | 09/90 | c | 4 | |
| 23214928 | Adriamycin [PAH-Derivative, POM] | | c | 1 2 3 4 5 | |
| 28981977 | Alprazolam [POM] | 09/90 | | 1 2 4 | |
| 39831555 | Amikacin sulfate | 09/90 | | 4 | |
| 54626 | Aminopterin | | | 4 | |
| 1005 | Analgesic mixtures containing phenacetin | | c | 3 4 5 | |
| 1010 | Androgenic (anabolic) steriods | | c | 3 4 | |
| | including but not limited to: | | | | |
| 58184 | Methyltestosterone | 09/90 | | 4 | |
| 434071 | Oxymetholone | | c | 4 5 | |
| 58220 | Testosterone and its esters | 09/89 | | 4 | |
| | including but not limited to: | | | | |
| 315377 | Testosterone enanthate | 09/90 | | 4 | |
| 50782 | Aspirin | 06/91 | | 4 | |
| 115026 | Azaserine | | c | 3 4 | |
| 5411223 | Benzphetamine hydrochloride [POM] | 09/90 | | 1 2 4 | |
| 154938 | Bischloroethyl nitrosourea | | c | 3 4 | |
| 55981 | 1,4-Butanediol dimethanesulfonate {Busulfen/ Myleran} | | c | 3 4 5 | |
| 41575944 | Carboplatin | 09/90 | | 4 | |
| 474259 | Chenodiol | 09/90 | | 4 | |
| 305033 | Chlorambucil | | c | 3 4 5 | |
| 56757 | Chloramphenicol | | c | 3 4 | |
| 1620219 | Chlorcyclizine hydrochloride [POM] | | | 1 2 4 | |
| 13010474 | 1-(2-Chloroethyl)-3-cyclohexyl-1-nitrosourea {CCNU} | | c | 3 4 5 | |
| 13909096 | 1-(2-Chloroethyl)-3-(4-methylcyclohexyl)-1-nitrosourea {Methyl CCNU} | | c | 3 | |
| 15663271 | Cisplatin | | c | 3 4 | |
| 50419 | Clomiphene citrate [POM] | 09/90 | | 1 2 4 | |
| 50180 | Cyclophosphamide | | c | 3 4 | |
| 147944 | Cytarabine | 09/89 | | 4 | |
| 4342034 | Dacarbazine | | c | 3 4 5 | |
| 17230885 | Danazol | 09/90 | | 4 | |
| 20830813 | Daunomycin [PAH-Derivative, POM] | | c | 1 2 3 4 | |
| 23541506 | Daunorubicin hydrochloride [PAH-Derivative, POM] | 09/90 | | 1 2 4 | |
| 84173 | Dienestrol [POM] | 09/90 | c | 1 2 4 | |
| 564250 | Doxycycline | 09/90 | | 4 | |
| 379793 | Ergotamine tartrate [POM] | 09/90 | | 1 2 4 | |
| 1095 | Estrogens, non-steroidal | | c | 3 5 | |
| | including but not limited to: | | | | |
| 56531 | Diethylstilbestrol [POM] | | c | 1 2 3 4 5 | |
| 1100 | Estrogens, steroidal | | c | 3 5 | |

| | | | | |
|---|---|---|---|---|
| | including but not limited to: | | | |
| 1068 | Conjugated estrogens | 09/90 | c | 4 |
| 50282 | Estradiol 17 beta | | c | 4 5 |
| 53167 | Estrone | | c | 4 5 |

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|---|---|---|---|---|---|
| 57636 | Ethinyl estradiol | | c | 4 5 | |
| 72333 | Mestranol | | c | 3 4 5 | |
| 33419420 | Etoposide [POM] | 09/90 | | 2 | |
| 54350480 | Etretinate | | | 4 | |
| 51218 | Fluorouracil | 09/89 | | 4 | |
| 76437 | Fluoxymesterone | 09/90 | | 4 | |
| 13311847 | Flutamide | 09/90 | | 4 | |
| 67458 | Furazolidone | 09/90 | c | 4 | |
| 126078 | Griseofulvin | | c | 3 4 | |
| 23092173 | Halazepam [POM] | 09/90 | | 1 2 4 | |
| 3778732 | Ifosfamide | 09/90 | | 4 | |
| 9004664 | Iron dextran complex | | c | 3 4 5 | |
| 303344 | Lasiocarpine | 09/89 | c | 3 4 | |
| 554132 | Lithium carbonate | 06/91 | | 4 | |
| 919164 | Lithium citrate | 06/91 | | 4 | |
| 846491 | Lorazepam [POM] | 09/90 | | 1 2 4 | |
| 595335 | Megestrol acetate | 06/91 | | 4 | |
| 148823 | Melphalan | | c | 3 4 5 | |
| 9002680 | Menotropins | 09/90 | | 4 | |
| 6112761 | Mercaptopurine | 09/90 | | 4 | |
| 531760 | Merphalan | 09/89 | c | 4 | |
| 3963959 | Methacycline hydrochloride | 06/91 | | 4 | |
| 60560 | Methimazole | 09/90 | | 4 | |
| 15475566 | Methotrexate sodium | 09/90 | | 4 | |
| 484208 | 5-Methoxypsoralen | | c | 3 | |
| 56042 | Methylthiouracil | | c | 3 4 | |
| 443481 | Metronidazole | | c | 3 4 5 | |
| 59467968 | Midazolam hydrochloride [POM] | 09/90 | | 1 2 4 | |
| 62015398 | Misoprostol | 09/90 | | 4 | |
| 50077 | Mitomycin C | | c | 3 4 | |
| 70476823 | Mitoxantrone hydrochloride [PAH-Derivative, POM] | 09/90 | | 1 2 4 | |
| 139913 | 5-(Morpholinomethyl)-3-[(5-nitrofurfurylidene)amino]-2-oxazolidinone | | c | 3 4 | |
| 86220420 | Nafarelin acetate [PAH-Derivative, POM] | 09/90 | | 1 2 4 | |
| 3771195 | Nafenopin [POM] | | c | 1 2 3 4 | |
| 1405103 | Neomycin sulfate | 09/90 | | 4 | |
| 56391572 | Netilmicin sulfate | 09/90 | | 4 | |
| 61574 | Niridazole | | c | 3 4 | |
| 67209 | Nitrofurantoin | 06/91 | c | 4 | |
| 59870 | Nitrofurazone | 09/90 | c | 4 | |
| 555840 | 1-[(5-Nitrofurfurylidene)amino]-2-imidazolidinone | | c | 3 4 | |
| 531828 | N-[4-(5-Nitro-2-furyl)-2-thiazolyl]acetamide | | c | 3 4 | |
| 6533002 | Norgestrel | 09/90 | | 4 | |
| 79572 | Oxytetracycline | 06/91 | | 4 | |

| | | | |
|---|---|---|---|
| 115673 | Paramethadione | 09/90 | 4 |
| 52675 | Penicillamine | 06/91 | 4 |

APPENDIX A-III
Substances Which Need Not Be Reported Unless Manufactured By the Facility

| Emittent ID (Note [1]) | Substance Name (Note [2]) | Add Date (Note [3]) | Carcinogen (Note [4]) | Source List(s) (Note [6]) | Other Notes(s) |
|---|---|---|---|---|---|
| 57330 | Pentobarbital sodium | 09/90 | | 4 | |
| 63989 | Phenacemide | 09/90 | | 4 | |
| 62442 | Phenacetin | | c | 3 4 5 | |
| 94780 | Phenazopyridine hydrochloride | | c | 3 4 5 | |
| 3546109 | Phenesterin | 09/89 | c | 4 5 | |
| 50066 | Phenobarbital | | c | 3 4 | |
| 59961 | Phenoxybenzamine [POM] | 09/89 | c | 1 2 4 | |
| 63923 | Phenoxybenzamine hydrochloride [POM] | 09/90 | c | 1 2 3 4 5 | |
| 54911 | Pipobroman | 09/90 | | 4 | |
| 18378897 | Plicamycin [PAH-Derivative, POM] | 09/90 | | 1 2 4 | |
| 366701 | Procarbazine hydrochloride | | c | 3 4 5 | |
| 57830 | Progesterone | | c | 3 4 5 | |
| 1160 | Progestins | | c | 3 | |
| | including but not limited to: | | | | |
| 71589 | Medroxyprogesterone acetate | | c | 3 4 | |
| 68224 | Norethisterone | | c | 4 5 | |
| 51525 | Propylthiouracil | | c | 3 4 5 | |
| 302794 | all-trans-Retinoic acid | 09/89 | | 4 | |
| 1167 | Retinol/retinyl esters | 09/89 | c | 4 | |
| 81072 | Saccharin | | c | 3 4 5 | |
| 3810740 | Streptomycin sulfate | 06/91 | | 4 | |
| 18883664 | Streptozotocin | | c | 3 4 5 | |
| 54965241 | Tamoxifen citrate [POM] | 09/90 | | 1 2 4 | |
| 846504 | Temazepam [POM] | 09/90 | | 1 2 4 | |
| 64755 | Tetracycline hydrochloride | 06/91 | | 4 | |
| 50351 | Thalidomide | | | 4 | |
| 154427 | Thioguanine | 09/90 | | 4 | |
| 49842071 | Tobramycin sulfate | 09/90 | | 4 | |
| 299752 | Treosulfan | | c | 3 4 | |
| 28911015 | Triazolam [POM] | 09/90 | | 1 2 4 | |
| 13647353 | Trilostane | 09/90 | | 4 | |
| 127480 | Trimethadione | 06/91 | | 4 | |
| 66751 | Uracil mustard | | c | 3 4 | |
| 26995915 | Urofollitropin | 09/90 | | 4 | |
| 99661 | Valproate | | | 4 | |
| 143679 | Vinblastine sulfate [POM] | 09/90 | | 1 2 4 | |
| 2068782 | Vincristine sulfate [POM] | 09/90 | | 1 2 4 | |

## NOTES TO APPENDIX A

**Note** **Text of Note**

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[ 1] Emittent ID (the emittent identification number) is the Chemical Abstract Service (CAS) number where available, or an ARB-assigned 4-digit emittent ID code.

A dash ("-") is shown for the Emittent ID for substances which are alphabetized under a group header or synonym elsewhere on the list. Refer to the cross reference indicated in parenthesis, "( )".

A double dash ("- -") is shown for the Emittent ID to indicate that the entry is a non-reportable group header for the substances immediately following it.

An asterisk ("*") is shown for the Emittent ID to indicate that the emissions of unspecified metal compounds shall be reported as the metal atom equivalent. See Note [7].

A pound sign ("#") is shown for the Emittent ID to indicate that the individual, component listed substances must be reported for this mixture or group.

[ 2] Individual substances listed under a group heading must be reported individually. Other, unspecified substances in the group must be summed and reported using the emittent ID of the group heading.

The square bracket designation, "[ ]", indicates that the substance is a component of the chemical group heading(s) within the brackets.

The braces designation, "{ }", indicates a synonym for the substance listed.

[ 3] The date the Board approved addition of the substance to the original list. The original list was approved by the Board in July 1988.

[ 4] The letter "c" indicates that for purposes of this section the substance shall be treated as a human carcinogen or potential human carcinogen.

[ 5] Applicable degree of accuracy (in lbs/year except where noted). Radionuclides must be reported in Curie units, and the accuracy must be considered accordingly. Refer to Section VII.E. and Appendix B.

| Note | Text of Note |
|---|---|

[ 6] Substances are required to be included on the Hot Spots list based on the following lists cited in Health & Safety Code Section 44321:

1 = California Air Resources Board (44321(c));
2 = Environmental Protection Agency (44321(e));
3 = International Agency for Research on Cancer; (44321(a); Labor Code section 6382(b)(1))
4 = Governor's List of Carcinogens and Reproductive Toxicants; (44321(b); HSC Section 25249.8)
5 = National Toxicology Program (44321(a));
6 = Hazard Evaluation System and Information Service (44321(d))
7 = Added pursuant to HSC Section 44321 (f).

[ 7] Emissions of unspecified metal compounds shall be reported as the amount of the metal atom equivalent, using the metal emittent identification number for the metal itself (or the emittent identification number indicated on the table, such as for reporting inorganic versus other-than-inorganic arsenic compounds).

For unspecified metal compounds which contain two or more listed metals (e.g., zinc chromate), each component metal shall be reported as the amount of the appropriate metal atom equivalent (i.e., the zinc portion of the weight as zinc equivalent and the chromate portion as hexavalent chromium equivalent).

For specific, individually listed metal compounds (e.g., Lead chromate), emissions shall be reported for the compound (as pounds of whole compound), using the emittent identification number for that compound.

[ 8] Compounds of the form "X-CN", where formal dissociation can occur. Report as the amount of Cyanide equivalent in the compound using an emittent identification code of 1073.

[ 9] Emissions of these mixtures shall be reported as emissions of total particulate matter and total organic gas, using the following emittent identification numbers:

9901 Diesel exhaust, particulate matter
9902 Diesel exhaust, total organic gas
9910 Gasoline exhaust, particulate matter
9911 Gasoline exhaust, total organic gas

Individually listed substances from diesel and gasoline exhaust must also be reported.

| Note | Text of Note |
|---|---|
| [10] | The emittent identification number 1105 has been discontinued for all facilities reporting for the first time and for all updates. Use the listed replacement emittent identification codes 1103 and 1104. |
| [11] | Emissions of the individual, component listed substances must be reported in addition to the total gasoline vapors emissions. |
| [12] | These lead compounds are listed here so that the inorganic lead fraction will be quantified and reported if these individual compounds cannot be quantified. |
| [13] | PAH: (Polycyclic Aromatic Hydrocarbon) - An organic compound consisting of a fused ring structure containing at least two (2) benzene rings, and which may also contain additional fused rings not restricted exclusively to hexagonal rings. The structure does not include any heteroatoms or substituent groups. The structure includes only carbon and hydrogen.<br><br>PAHs are a subgroup of POM and have a boiling point of greater than or equal to 100 C. |
| [14] | PAH-DERIVATIVE: (Polycyclic Aromatic Hydrocarbon Derivative) - An organic compound consisting of a fused ring structure containing at least two (2) benzene rings, and which may also contain additional fused rings not restricted exc lusively to hexagonal rings. The fused ring structure does not contain heteroatoms. The structure does contain one or more substituent groups.<br><br>PAH-Derivatives are a subgroup of POM and have a boiling point of greater than or equal to 100 C. |
| [15] | POM: (Polycyclic Organic Matter) - Includes organic compounds with more than one benzene ring, and which have a boiling point of greater than or equal to 100 C. |
| [16] | Radionuclides and other radioactive substances shall be reported in units of Curies per year (for annual average emissions) and in units of milliCuries per hour (for maximum hourly emissions). |
| [17] | Emissions of Vanadium (fume or dust) shall be reported as the amount of the vanadium atom equivalent, using the identification number 7440622. |
| [18] | The emittent identification number 1001 has been replaced with the CAS number 26148685. |

# Appendix B

# Health And Safety Code Related to the

# Air Toxics Hot Spots Program

# Appendix B

## Health And Safety Code Related To The Air Toxics Hot Spots Program[1]

PART 6. AIR TOXICS "HOT SPOTS" INFORMATION AND ASSESSMENT
(Part 6 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384. Note: Sections 44380 and 44384 became operative Jan. 1, 1988.)

CHAPTER 1. LEGISLATIVE FINDINGS AND DEFINITIONS
(Chapter 1 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44300. This part shall be known and may be cited as the Air Toxics "Hot Spots" Information and Assessment Act of 1987. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44301. The Legislature finds and declares all of the following:

(a) In the wake of recent publicity surrounding planned and unplanned releases of toxic chemicals into the atmosphere, the public has become increasingly concerned about toxics in the air.

(b) The Congressional Research Service of the Library of Congress has concluded that 75 percent of the United States population lives in proximity to at least one facility that manufactures chemicals. An incomplete 1985 survey of large chemical companies conducted by the Congressional Research Service documented that nearly every chemical plant studied routinely releases into the surrounding air significant levels of substances proven to be or potentially hazardous to public health.

(c) Generalized emissions inventories compiled by air pollution control districts and air quality management districts in California confirm the findings of the Congressional Research Service survey as well as reveal that many other facilities and businesses which do not actually manufacture chemicals do use hazardous substances in sufficient quantities to expose, or in a manner that exposes, surrounding populations to toxic air releases.

(d) These releases may create localized concentrations or air toxics "hot spots" where emissions from specific sources may expose individuals and population groups to elevated risks of adverse health effects, including, but not limited to, cancer and contribute to the cumulative health risks of emissions from other sources in the area. In some cases where large populations may not be significantly affected by adverse health risks, individuals may be exposed to significant risks.

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[1] *AB564 Passed in the 1996 legislative session. The text will be added when the code is revised.*

(e) Little data is currently available to accurately assess the amounts, types, and health impacts of routine toxic chemical releases into the air. As a result, there exists significant uncertainty about the amounts of potentially hazardous air pollutants which are released, the location of those releases, and the concentrations to which the public is exposed.
(f) The State of California has begun to implement a long-term program to identify, assess, and control ambient levels of hazardous air pollutants, but additional legislation is needed to provide for the collection and evaluation of information concerning the amounts, exposures, and short- and long-term health effects of hazardous substances regularly released to the surrounding atmosphere from specific sources of hazardous releases.
(g) In order to more effectively implement control strategies for those materials posing an unacceptable risk to the public health, additional information on the sources of potentially hazardous air pollutants is necessary.
(h) It is in the public interest to ascertain and measure the amounts and types of hazardous releases and potentially hazardous releases from specific sources that may be exposing people to those releases, and to assess the health risks to those who are exposed. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44302. The definitions set forth in this chapter govern the construction of this part. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44303. "Air release" or "release" means any activity that may cause the issuance of air contaminants, including the actual or potential spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of a substance into the ambient air and that results from the routine operation of a facility or that is predictable, including, but not limited to, continuous and intermittent releases and predictable process upsets or leaks. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44304. "Facility" means every structure, appurtenance, installation, and improvement on land which is associated with a source of air releases or potential air releases of a hazardous material. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44306. "Health risk assessment" means a detailed comprehensive analysis prepared pursuant to Section 44361 to evaluate and predict the dispersion of hazardous substances in the environment and the potential for exposure of human populations and to assess and quantify both the individual and population wide health risks associated with those levels of exposure. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44307. "Operator" means the person who owns or operates a facility or part of a facility. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44308. "Plan" means the emissions inventory plan which meets the conditions specified in Section 44342. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44309. "Report" means the emissions inventory report specified in Section 44341. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

## CHAPTER 2. FACILITIES SUBJECT TO THIS PART

(Chapter 2 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44320. This part applies to the following:

(a) Any facility which manufactures, formulates, uses, or releases any of the substances listed pursuant to Section 44321 or any other substance which reacts to form a substance listed in Section 44321 and which releases or has the potential to release total organic gases, particulates, or oxides of nitrogen or sulfur in the amounts specified in Section 44322.

(b) Except as provided in Section 44323, any facility which is listed in any current toxics use or toxics air emission survey, inventory, or report released or compiled by a district. A district may, with the concurrence of the state board, waive the application of this part pursuant to this subdivision for any facility which the district determines will not release any substance listed pursuant to Section 44321 due to a shutdown or a process change. (Amended by Stats. 1989, Ch. 1254, Sec. 7). References at the time of publication (see page iii): Regulations: 17, CCR, sections 90700-90703, 90704, 93303, 93306

44321. For the purposes of Section 44320, the state board shall compile and maintain a list of substances that contains, but is not limited to, all of the following:

(a) Substances identified by reference in paragraph (1) of subdivision (b) of Section 6382 of the Labor Code and substances placed on the list prepared by the National Toxicology Program issued by the United States Secretary of Health and Human Services pursuant to paragraph (4) of Section 262 of Public Law 95-622 of 1978. For the purposes of this subdivision, the state board may remove from the list any substance which meets both of the following criteria:
   (1) No evidence exists that it has been detected in air.
   (2) The substance is not manufactured or used in California, or, if manufactured or used in California, because of the physical or chemical characteristics of the substance or the manner in which it is manufactured or used, there is no possibility that it will become airborne.

(b) Carcinogens and reproductive toxins referenced in or compiled pursuant to Section 25249.8, except those which meet both of the criteria identified in subdivision (a).

(c) The candidate list of potential toxic air contaminants and the list of designated toxic air contaminants prepared by the state board pursuant to Article 2 (commencing with Section 39660) of Chapter 3.5 of Part 2, including, but not limited to, all substances currently under review and scheduled or nominated for review and substances identified and listed for which health effects information is limited.

(d) Substances for which an information or hazard alert has been issued by the repository of current data established pursuant to Section 147.2 of the Labor Code.
(e) Substances reviewed, under review, or scheduled for review as air toxics or potential air toxics by the Office of Air Quality Planning and Standards of the Environmental Protection Agency, including substances evaluated in all of the following categories or their equivalent: preliminary health and source screening, detailed assessment, intent to list, decision not to regulate, listed, standard proposed, and standard promulgated.
(f) Any additional substances recognized by the state board as presenting a chronic or acute threat to public health when present in the ambient air, including, but not limited to, any neurotoxins or chronic respiratory toxins not included within subdivision (a), (b), (c), (d), or (e). (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44322. This part applies to facilities specified in subdivision (a) of Section 44320 in accordance with the following schedule:
(a) For those facilities that release, or have the potential to release, 25 tons per year or greater of total organic gases, particulates, or oxides of nitrogen or sulfur, this part becomes effective on July 1, 1988.
(b) For those facilities that release, or have the potential to release, more than 10 but less than 25 tons per year of total organic gases, particulates, or oxides of nitrogen or sulfur, this part becomes effective July 1, 1989.
(c) For those facilities that release, or have the potential to release, less than 10 tons per year of total organic gases, particulates, or oxides of nitrogen or sulfur, the state board shall, on or before July 1, 1990, prepare and submit a report to the Legislature identifying the classes of those facilities to be included in this part and specifying a timetable for their inclusion. (Amended by Stats. 1989, Ch. 1254, Sec. 8.)

44323. A district may prepare an industrywide emissions inventory and health risk assessment for facilities specified in subdivision (b) of Section 44320 and subdivisions (a) and (b) of Section 44322, and shall prepare an industrywide emissions inventory for the facilities specified in subdivision (c) of Section 44322, in compliance with this part for any class of facilities that the district finds and determines meets all of the following conditions:
(a) All facilities in the class fall within one four-digit Standard Industrial Classification Code.
(b) Individual compliance with this part would impose severe economic hardships on the majority of the facilities within the class.
(c) The majority of the class is composed of small businesses.
(d) Releases from individual facilities in the class can easily and generically be characterized and calculated. (Amended by Stats. 1989, Ch. 1254, Sec. 9.)

44324. This part does not apply to any facility where economic poisons are employed in their pesticidal use, unless that facility was subject to district permit requirements on or before August 1,1987. As used in this section, "pesticidal use" does not include the manufacture or formulation of pesticides. (Added by Stats. 1981, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44325. Any solid waste disposal facility in compliance with Section 41805.5 is in compliance with the emissions inventory requirements of this part. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

## CHAPTER 3. AIR TOXICS EMISSION INVENTORIES
(Chapter 3 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44340. (a) The operator of each facility subject to this part shall prepare and submit to the district a proposed comprehensive emissions inventory plan in accordance with the criteria and guidelines adopted by the state board pursuant to Section 44342.

(b) The proposed plan shall be submitted to the district on or before August 1, 1989, except that, for any facility to which subdivision (b) of Section 44322 applies, the proposed plan shall be submitted to the district on or before August 1,1990. The district shall approve, modify, and approve as modified, or return for revision and resubmission, the plan within 120 days of receipt.

(c) The district shall not approve a plan unless all of the following conditions are met:

(1) The plan meets the requirements established by the state board pursuant to Section 44342.

(2) The plan is designed to produce, from the list compiled and maintained pursuant to Section 44321, a comprehensive characterization of the full range of hazardous materials that are released, or that may be released, to the surrounding air from the facility. Air release data shall be collected at, or calculated for, the primary locations of actual and potential release for each hazardous material. Data shall be collected or calculated for all continuous, intermittent, and predictable air releases.

(3) The measurement technologies and estimation methods proposed provide state-of-the-art effectiveness and are sufficient to produce a true representation of the types and quantities of air releases from the facility.

(4) Source testing or other measurement techniques are employed wherever necessary to verify emission estimates, as determined by the state board and to the extent technologically feasible. All testing devices shall be appropriately located, as determined by the state board.

(5) Data are collected or calculated for the relevant exposure rate or rates of each hazardous material according to its characteristic toxicity and for the emission rate necessary to ensure a characterization of risk associated with exposure to releases of the hazardous material that meets the requirements of Section 44361. The source of all emissions shall be displayed or described. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44341. Within 180 days after approval of a plan by the district, the operator shall implement the plan and prepare and submit a report to the district in accordance with the plan. The district shall transmit all monitoring data contained in the approved report to the state board. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44342. The state board shall, on or before May 1, 1989, in consultation with the districts, develop criteria and guidelines for site-specific air toxics emissions inventory plans which shall be designed to comply with the conditions specified in Section 44340 and which shall include at least all of the following:

(a) For each class of facility, a designation of the hazardous materials for which emissions are to be quantified and an identification of the likely source types within that class of facility. The hazardous materials for quantification shall be chosen from among, and may include all or part of, the list specified in Section 44321.

(b) Requirements for a facility diagram identifying each actual or potential discrete emission point and the general locations where fugitive emissions may occur. The facility diagram shall include any nonpermitted and nonprocess sources of emissions and shall provide the necessary data to identify emission characteristics. An existing facility diagram which meets the requirements of this section may be submitted.

(c) Requirements for source testing and measurement. The guidelines may specify appropriate uses of estimation techniques including, but not limited to, emissions factors, modeling, mass balance analysis, and projections, except that source testing shall be required wherever necessary to verify emission estimates to the extent technologically feasible. The guidelines shall specify conditions and locations where source testing, fence-line monitoring, or other measurement techniques are to be required and the frequency of that testing and measurement.

(d) Appropriate testing methods, equipment, and procedures, including quality assurance criteria.

(e) Specifications for acceptable emissions factors, including, but not limited to, those which are acceptable for substantially similar facilities or equipment, and specification of procedures for other estimation techniques and for the appropriate use of available data.

(f) Specification of the reporting period required for each hazardous material for which emissions will be inventoried.

(g) Specifications for the collection of useful data to identify toxic air contaminants pursuant to Article 2 (commencing with Section 39660) of Chapter 3.5 of Part 2.

(h) Standardized format for preparation of reports and presentation of data.

(i) A program to coordinate and eliminate any possible overlap between the requirements of this chapter and the requirements of Section 313 of the Superfund Amendment and Reauthorization Act of 1986 ( Public Law 99-499). The state board shall design the guidelines and criteria to ensure that, in collecting data to be used for emissions inventories, actual measurement is utilized whenever necessary to verify the accuracy of emission estimates, to the extent technologically feasible. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44343. The district shall review the reports submitted pursuant to Section 44341 and shall, within 90 days, review each report, obtain corrections and clarifications of the data, and notify the Office of Environmental Health Hazard Assessment, the Department of Industrial Relations, and the city or county health department of its findings and determinations as a result of its review of the report. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384. Amended by Governor's Reorganization Plan No. 1 of 1991, §142.)

44344. Except as provided in Section 44391, emissions inventories developed pursuant to this chapter shall be updated every four years, in accordance with the procedures established by the state board. Those updates shall take into consideration improvements in measurement techniques and advancing knowledge concerning the types and toxicity of hazardous material released or potentially released. (Amended by Stats. 1993, Ch. 1041, Sec. 1. Effective January 1, 1994.)

44344.3.

(a) A facility shall be granted an exemption by a district from further compliance with this part after meeting all of the following criteria:
    (1) The facility was required to comply with this part only as a result of its particulate matter emissions.
    (2) The facility has participated in, utilized data derived from, or is eligible to utilize data derived from, approved pooled source testing.
    (3) The facility has submitted an emissions inventory plan and report that was subsequently accepted and approved.
    (4) The facility has been designated by the district as a low priority facility under the guidelines set forth pursuant to this part for facility prioritization, and facility emissions do not present a significant health risk as specified in subdivision (b) of Section 44362.
    (5) The facility handles, processes, stores, or distributes bulk agricultural commodities or handles, feeds, or rears livestock. (b) Subdivision (a) does not apply to a facility that, because of information provided pursuant to Section 44344.7, is reclassified as an intermediate or high priority facility by the district.
(c) The operator of a facility that has been granted an exemption pursuant to this section shall biennially submit a statement to the district for the district's review, with a copy of the most recent emissions inventory for the facility, indicating that, except as to matters for which an emissions inventory update has been or will be submitted pursuant to Section 44344.7, there has been no significant change in facility operations or activities. The district shall not impose any fee upon the operator with regard to the submission of the statement. (Added by Stats. 1993, Ch. 1037, Sec. 1. Effective January 1, 1994.)

44344.5. The operator of any new facility that previously has not been subject to this part shall prepare and submit an emissions inventory plan and report. (Added by Stats. 1993, Ch. 1037, Sec. 2. Effective January 1, 1994.)

44344.7. The operator of a facility exempted pursuant to subdivision (a) of Section 44344.3 shall submit an emissions inventory update for those sources and substances for which a change in activities or operations has occurred, as follows:

(a) The facility emits a newly listed substance.
(b) A sensitive receptor has been established or constructed on or after January 1, 1994, within 500 meters of the facility.
(c) The facility emits a substance for which the potency factor has increased.

(d) The facility has begun emission of a listed substance not included in the previous emissions inventory. (Added by Stats. 1993, Ch. 1037, Sec. 3. Effective January 1, 1994.)

44345. (a) On or before July 1, 1989, the state board shall develop a program to compile and make available to other state and local public agencies and the public all data collected pursuant to this chapter.

(b) In addition, the state board, on or before March 1, 1990, shall compile, by district, emissions inventory data for mobile sources and area sources not subject to district permit requirements, and data on natural source emissions, and shall incorporate these data into data compiled and released pursuant to this chapter. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44346. (a) If an operator believes that any information required in the facility diagram specified pursuant to subdivision (b) of Section 44342 involves the release of a trade secret, the operator shall nevertheless make the disclosure to the district, and shall notify the district in writing of that belief in the report.

(b) Subject to this section, the district shall protect from disclosure any trade secret designated as such by the operator, if that trade secret is not a public record.

(c) Upon receipt of a request for the release of information to the public which includes information which the operator has notified the district is a trade secret and which is not a public record, the following procedure applies:

(1) The district shall notify the operator of the request in writing by certified mail, return receipt requested.

(2) The district shall release the information to the public, but not earlier than 30 days after the date of mailing the notice of the request for information, unless, prior to the expiration of the 30-day period, the operator obtains an action in an appropriate court for a declaratory judgment that the information is subject to protection under this section or for a preliminary injunction prohibiting disclosure of the information to the public and promptly notifies the district of that action.

(d) This section does not permit an operator to refuse to disclose the information required pursuant to this part to the district.

(e) Any information determined by a court to be a trade secret, and not a public record pursuant to this section, shall not be disclosed to anyone except an officer or employee of the district, the state, or the United States, in connection with the official duties of that officer or employee under any law for the protection of health, or to contractors with the district or the state and its employees if, in the opinion of the district or the state, disclosure is necessary and required for the satisfactory performance of a contract, for performance of work, or to protect the health and safety of the employees of the contractor.

(f) Any officer or employee of the district or former officer or employee who, by virtue of that employment or official position, has possession of, or has access to, any trade secret subject to this section, and who, knowing that disclosure of the information to the general public is prohibited by this section, knowingly and willfully discloses the information in any manner to any person not entitled to receive it is guilty of a

misdemeanor. Any contractor of the district and any employee of the contractor, who has been furnished information as authorized by this section, shall be considered an employee of the district for purposes of this section.

(g) Information certified by appropriate officials of the United States as necessary to be kept secret for national defense purposes shall be accorded the full protections against disclosure as specified by those officials or in accordance with the laws of the United States

(h) As used in this section, "trade secret" and "public record" have the meanings and protections given to them by Section 6254.7 of the Government Code and Section 1060 of the Evidence Code. All information collected pursuant to this chapter, except for data used to calculate emissions data required in the facility diagram, shall be considered "air pollution emission data," for the purposes of this section. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

## CHAPTER 4. RISK ASSESSMENT

(Chapter 4 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44360. (a) Within 90 days of completion of the review of all emissions inventory data for facilities specified in subdivision (a) of Section 44322, but not later than December 1,1990, the district shall, based on examination of the emissions inventory data and in consultation with the state board and the State Department of Health Services, prioritize and then categorize those facilities for the purposes of health risk assessment. The district shall designate high, intermediate, and low priority categories and shall include each facility within the appropriate category based on its individual priority. In establishing priorities pursuant to this section, the district shall consider the potency, toxicity, quantity, and volume of hazardous materials released from the facility, the proximity of the facility to potential receptors, including, but not limited to, hospitals, schools, day care centers, worksites, and residences, and any other factors that the district finds and determines may indicate that the facility may pose a significant risk to receptors. The district shall hold a public hearing prior to the final establishment of priorities and categories pursuant to this section.

(b) (1) Within 150 days of the designation of priorities and categories pursuant to subdivision (a), the operator of every facility that has been included within the highest priority category shall prepare and submit to the district a health risk assessment pursuant to Section 44361. The district may, at its discretion, grant a 30-day extension for submittal of the health risk assessment.

(2) Health risk assessments required by this chapter shall be prepared in accordance with guidelines established by the Office of Environmental Health Hazard Assessment. The office shall prepare draft guidelines which shall be circulated to the public and the regulated community and shall adopt risk assessment guidelines after consulting with the state board and the Risk Assessment Committee of the California Air Pollution Control Officers Association and after conducting at least two public workshops, one in the northern and one in the southern part of the state. The adoption of the guidelines is not subject to

Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code. The scientific review panel established pursuant to Section 39670 shall evaluate the guidelines adopted under this paragraph and shall recommend changes and additional criteria to reflect new scientific data or empirical studies.

(3) The guidelines established pursuant to paragraph (2) shall impose only those requirements on facilities subject to this subdivision that are necessary to ensure that a required risk assessment is accurate and complete and shall specify the type of site-specific factors that districts may take into account in determining when a single health risk assessment may be allowed under subdivision (d). The guidelines shall, in addition, allow the operator of a facility, at the operator's option, and to the extent that valid and reliable data are available, to include for consideration by the district in the health risk assessment any or all of the following supplemental information:

(a) Information concerning the scientific basis for selecting risk parameter values that are different than those required by the guidelines and the likelihood distributions that result when alternative values are used.

(b) Data from dispersion models, microenvironment characteristics, and population distributions that may be used to estimate maximum actual exposure.

(c) Risk expressions that show the likelihood that any given risk estimate is the correct risk value.

(d) A description of the incremental reductions in risk that occur when exposure is reduced.

(4) To ensure consistency in the use of the supplemental information authorized by subparagraphs (A), (B), (C),and (D) of paragraph (3),the guidelines established pursuant to paragraph (2) shall include guidance for use by the districts in considering the supplemental information when it is included in the health risk assessment. (c) Upon submission of emissions inventory data for facilities specified in subdivisions (b) and (c) of Section 44322, the district shall designate facilities for inclusion within the highest priority category, as appropriate, and any facility so designated shall be subject to subdivision (b). In addition, the district may require the operator of any facility to prepare and submit health risk assessments, in accordance with the priorities developed pursuant to subdivision (a).

(e) The district shall, except where site specific factors may affect the results, allow the use of a single health risk assessment for two or more substantially identical facilities operated by the same person.

(f) Nothing contained in this section, Section 44380.5, or Chapter 6 (commencing with Section 44390) shall be interpreted as requiring a facility operator to prepare a new or revised health risk assessment using the guidelines established pursuant to paragraph (2) of subdivision (a) of this section if the facility operator is required by the district to begin the preparation of a health risk assessment before those guidelines are established. (Amended by Stats. 1992, Ch. 1162, Sec. 1. Effective January 1, 1993.)

44361. (a) Each health risk assessment shall be submitted to the district. The district shall make he health risk assessment available for public review, upon request. After preliminary review of the emissions impact and modeling data, the district shall submit the health risk assessment to the Office of Environmental Health Hazard Assessment for review and, within 180 days of receiving the health risk assessment, the office shall submit to the district its comments on the data and findings relating to health effects. The district shall consult with the state board as necessary to adequately evaluate the emissions impact and modeling data contained within the risk assessment.

(b) For the purposes of complying with this section, the Office of Environmental Health Hazard Assessment may select a qualified independent contractor to review the data and findings relating to health effects. The office shall not select an independent contractor to review a specific health risk assessment who may have a conflict of interest with regard to the review of that health risk assessment. Any review by an independent contractor shall comply with the following requirements:
   (1) Be performed in a manner consistent with guidelines provided by the office.
   (2) Be reviewed by the office for accuracy and completeness.
   (3) Be submitted by the office to the district in accordance with this section.

(c) The district shall reimburse the Office of Environmental Health Hazard Assessment or the qualified independent contractor designated by the office pursuant to subdivision (b), within 45 days of its request, for its actual costs incurred in reviewing a health risk assessment pursuant to this section.

(d) If a district requests the Office of Environmental Health Hazard Assessment to consult with the district concerning any requirement of this part, the district shall reimburse the office, within 45 days of its request, for the costs incurred in the consultation.

(e) Upon designation of the high priority facilities, as specified in subdivision (a) of Section 44360, the Office of Environmental Health Hazard Assessment shall evaluate the staffing requirements of this section and may submit recommendations to the Legislature, as appropriate, concerning the maximum number of health risk assessments to be reviewed each year pursuant to this section. (Added by Stats. 1987, Ch. 1252, Sec. l. Operative July 1, 1988, pursuant to Section

44384. Amended by Governor's Reorganization Plan No. l of l991, §144.)

44362. (a) Taking the comments of the Office of Environmental Health Hazard Assessment into account, the district shall approve or return for revision and resubmission and then approve, the health risk assessment within 180 days of receipt. If the health risk assessment has not been revised and resubmitted within 60 days of the district's request of the operator to do so, the district may modify the health risk assessment and approve it as modified.

(b) Upon approval of the health risk assessment, the operator of the facility shall provide notice to all exposed persons regarding the results of the health risk assessment prepared pursuant to Section 44361 if, in the judgment of the district, the health risk assessment indicates there is a significant health risk associated with emissions from the facility. If notice is required under this subdivision, the notice shall include only

information concerning significant health risks attributable to the specific facility for which the notice is required. Any notice shall be made in accordance with procedures specified by the district. (Added by Stats. 1981, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384. Amended by Governor's Reorganization Plan No. 1 of 1991, 145.)

44363. (a) Commencing July 1, 1991, each district shall prepare and publish an annual report which does all of the following:
(1) Describes the priorities and categories designated pursuant to Section 44360 and summarizes the results and progress of the health risk assessment program undertaken pursuant to this part.
(2) Ranks and identifies facilities according to the degree of cancer risk posed both to individuals and to the exposed population.
(3) Identifies facilities which expose individuals or populations to any noncancer health risks.
(4) Describes the status of the development of control measures to reduce emissions of toxic air contaminants, if any.
(b) The district shall disseminate the annual report to county boards of supervisors, city councils, and local health officers and the district board shall hold one or more public hearings to present the report and discuss its content and significance. (Added by Stats. 1987, Ch. 1252, Sec. l. Operative July 1, 1988, pursuant to Section 44384.)

44364. The state board shall utilize the reports and assessments developed pursuant to this part for the purposes of identifying, establishing priorities for, and controlling toxic air contaminants pursuant to Chapter 3.5 (commencing with Section 39650) of Part 2. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384. )

44365. (a) If the state board finds and determines that a district's actions pursuant to this part do not meet the requirements of this part, the state board may exercise the authority of the district pursuant to this part to approve emissions inventory plans and require the preparation of health risk assessments.
(b) This part does not prevent any district from establishing more stringent criteria and requirements than are specified in this part for approval of emissions inventories and requiring the preparation and submission of health risk assessments. Nothing in this part limits the authority of a district under any other provision of law to assess and regulate releases of hazardous substances. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44366. (a) In order to verify the accuracy of any information submitted by facilities pursuant to this part, a district or the state board may proceed in accordance with Section 41510. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

## CHAPTER 5. FEES AND REGULATIONS
(Chapter 5 added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384.)

44380. (a) The state board shall adopt a regulation which does all of the following:

(1) Sets forth the amount of revenue which the district must collect to recover the reasonable anticipated cost which will be incurred by the state board and the Office of Environmental Health Hazard Assessment to implement and administer this part.

(2) Requires each district to adopt a fee schedule which recovers the costs of the district and which assesses a fee upon the operator of every facility subject to this part. A district may request the state board to adopt a fee schedule for the district if the district's program costs are approved by the district board and transmitted to the state board by April 1 of the year in which the request is made.

(3) Requires any district that has an approved toxics emissions inventory compiled pursuant to this part by August 1 of the preceding year to adopt a fee schedule, as described in paragraph (2), which imposes on facility operators fees which are, to the maximum extent practicable, proportionate to the extent of the releases identified in the toxics emissions inventory and the level of priority assigned to that source by the district pursuant to Section 44360.

(b) Commencing August 1, 1992, and annually thereafter, the state board shall review and may amend the fee regulation.

(c) The district shall notify each person who is subject to the fee of the obligation to pay the fee. If a person fails to pay the fee within 60 days after receipt of this notice, the district, unless otherwise provided by district rules, shall require the person to pay an additional administrative civil penalty. The district shall fix the penalty at not more than 100 percent of the assessed fee, but in an amount sufficient in its determination, to pay the district's additional expenses incurred by the person's noncompliance. If a person fails to pay the fee within 120 days after receipt of this notice, the district may initiate permit revocation proceedings. If any permit is revoked, it shall be reinstated only upon full payment of the overdue fee plus any late penalty, and a reinstatement fee to cover administrative costs of reinstating the permit.

(d) Each district shall collect the fees assessed pursuant to subdivision (a). After deducting the costs to the district to implement and administer this part, the district shall transmit the remainder to the Controller for deposit in the Air Toxics Inventory and Assessment Account, which is hereby created in the General Fund. The money in the account is available, upon appropriation by the Legislature, to the state board and the Office of Environmental Health Hazard Assessment for the purposes of administering this part. (Amended by Stats. 1992, Ch. 375, Sec. 1. Effective January 1, 1993.)

44380.1. A facility shall be granted an exemption by a district from paying a fee in accordance with Section 44380 if all of the following criteria are met:

(a) The facility primarily handles, processes, stores, or distributes bulk agricultural commodities or handles, feeds, or rears livestock.

(b) The facility was required to comply with this part only as a result of its particulate matter emissions.

(c) The fee schedule adopted by the district or the state board for these types of facilities is not solely based on toxic emissions weighted for potency or toxicity. (Added by Stats. 1993, Ch. 1037, Sec. 4. Effective January 1, 1994.)

44380.5. In addition to the fee assessed pursuant to Section 44380, a supplemental fee may be assessed by the district, the state board, or the Office of Environmental Health Hazard Assessment upon the operator of a facility that, at the operator's option, includes supplemental information authorized by paragraph (3) of subdivision (b) of Section 44360 in a health risk assessment, if the review of that supplemental information substantially increases the costs of reviewing the health risk assessment by the district, the state board, or the office. The supplemental fee shall be set by the state board in the regulation required by subdivision (a) of Section 44380 and shall be set in an amount sufficient to cover the direct costs to review the information supplied by an operator pursuant to paragraph (3) of subdivision (b) of Section 44360. (Added by Stats. 1992, Ch. 1162, Sec. 2. Effective January 1, 1993.)

44381. (a) Any person who fails to submit any information, reports, or statements required by this part, or who fails to comply with this part or with any permit, rule, regulation, or requirement issued or adopted pursuant to this part, is subject to a civil penalty of not less than five hundred dollars ($500) or more than ten thousand dollars ($10,000) for each day that the information, report, or statement is not submitted, or that the violation continues.

(b) Any person who knowingly submits any false statement or representation in any application, report, statement, or other document filed, maintained, or used for the purposes of compliance with this part is subject to a civil penalty of not less than one thousand dollars ($1,000) or more than twenty-five thousand dollars ($25,000) per day for each day that the information remains uncorrected. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1988, pursuant to Section 44384.)

44382. Every district shall, by regulation, adopt the requirements of this part as a condition of every permit issued pursuant to Chapter 4 (commencing with Section 42300) of Part 4 for all new and modified facilities. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative July 1, 1988, pursuant to Section 44384. )

44384. Except for Section 44380 and this section, all provisions of this part shall become operative on July 1, 1988. (Added by Stats. 1987, Ch. 1252, Sec. 1. Operative January 1, 1988, by its own provisions.)

## CHAPTER 6. FACILITY TOXIC AIR CONTAMINANT RISK REDUCTION AUDIT AND PLAN

(Chapter 6 added by Stats. 1992, Ch. 1162, Sec. 3. Effective January 1, 1993.)

44390. For purposes of this chapter, the following definitions apply:

(a) "Airborne toxic risk reduction measure" or "ATRRM" means those in-plant changes in production processes or feedstocks that reduce or eliminate toxic air emissions subject to this part. ATRRM's may include:

(1) Feedstock modification.

(2) Product reformulations.
(3) Production system modifications.
(4) System enclosure, emissions control, capture, or conversion.
(5) Operational standards and practices modification.

(b) Airborne toxic risk reduction measures do not include measures that will increase risk from exposure to the chemical in another media or that increase the risk to workers or consumers.

(c) "Airborne toxic risk reduction audit and plan" or "audit and plan" means the audit and plan specified in Section 44392. (Added by Stats. 1992, Ch. 1162, Sec. 3. Effective January 1, 1993.)

44391. (a) Whenever a health risk assessment approved pursuant to Chapter 4 (commencing with Section 44360) indicates, in the judgment of the district, that there is a significant risk associated with the emissions from a facility, the facility operator shall conduct an airborne toxic risk reduction audit and develop a plan to implement airborne toxic risk reduction measures that will result in the reduction of emissions from the facility to a level below the significant risk level within five years of the date the plan is submitted to the district. The facility operator shall implement measures set forth in the plan in accordance with this chapter.

(b) The period to implement the plan required by subdivision (a) may be shortened by the district if it finds that it is technically feasible and economically practicable to implement the plan to reduce emissions below the significant risk level more quickly or if it finds that the emissions from the facility pose an unreasonable health risk.

(c) A district may lengthen the period to implement the plan required by subdivision (a) by up to an additional five years if it finds that a period longer than five years will not result in an unreasonable risk to public health and that requiring implementation of the plan within five years places an unreasonable economic burden on the facility operator or is not technically feasible.

(d) (1) The state board and districts shall provide assistance to smaller businesses that have inadequate technical and financial resources for obtaining information, assessing risk reduction methods, and developing and applying risk reduction techniques.

(2) Risk reduction audits and plans for any industry subject to this chapter which is comprised mainly of small businesses using substantially similar technology may be completed by a self-conducted audit and checklist developed by the state board. The state board, in coordination with the districts, shall provide a copy of the audit and checklist to small businesses within those industries to assist them to meet the requirements of this chapter.

(e) The audit and plan shall contain all the information required by Section 44392.

(f) The plan shall be submitted to the district, within six months of a district's determination of significant risk, for review of completeness. Operators of facilities that have been notified prior to January 1, 1993, that there is a significant risk associated with emissions from the facility shall submit the plan by July 1, 1993. The district's review of completeness shall include a substantive analysis of the emission reduction measures included in the plan, and the ability of those measures to achieve

emission reduction goals as quickly as feasible as provided in subdivisions (a) and (b).

(g) The district shall find the audit and plan to be satisfactory within three months if it meets the requirements of this chapter, including, but not limited to, subdivision (f). If the district determines that the audit and plan does not meet those requirements, the district shall remand the audit and plan to the facility specifying the deficiencies identified by the district. A facility operator shall submit a revised audit and plan addressing the deficiencies identified by the district within 90 days of receipt of a deficiency notice.

(h) Progress on the emission reductions achieved by the plan shall be reported to the district in emissions inventory updates. Emissions inventory updates shall be prepared as required by the audit and plan found to be satisfactory by the district pursuant to subdivision (g).

(i) If new information becomes available after the initial risk reduction audit and plan, on air toxics risks posed by a facility, or emission reduction technologies that may be used by a facility that would significantly impact risks to exposed persons, the district may require the plan to be updated and resubmitted to the district.

(j) This section does not authorize the emission of a toxic air contaminant in violation of an airborne toxic control measure adopted pursuant to Chapter 3.5 (commencing with Section 39650) or in violation of Section 41700. (Amended by Stats. 1993, Ch. 1041, Sec. 2. Effective January 1, 1994.)

44392. A facility operator subject to this chapter shall conduct an airborne toxic risk reduction audit and develop a plan which shall include at a minimum all of the following:

(a) The name and location of the facility.

(b) The SIC code for the facility.

(c) The chemical name and the generic classification of the chemical.

(d) An evaluation of the ATRRM's available to the operator.

(e) The specification of, and rationale for, the ATRRMs that will be implemented by the operator. The audit and plan shall document the rationale for rejecting ATRRMs that are identified as infeasible or too costly.

(f) A schedule for implementing the ATRRMs. The schedule shall meet the time requirements of subdivision (a) of Section 44391 or the time period for implementing the plan set by the district pursuant to subdivision (b) or (c) of Section 44391, whichever is applicable.

(g) The audit and plan shall be reviewed and certified as meeting this chapter by an engineer who is registered as a professional engineer pursuant to Section 6762 of the Business and Professions Code, by an individual who is responsible for the processes and operations of the site, or by an environmental assessor registered pursuant to Section 25570.3. (Added by Stats. 1992, Ch. 1162, Sec. 3. Effective January 1, 1993.)

44393. The plan prepared pursuant to Section 44391 shall not be considered to be the equivalent of a pollution prevention program or a source reduction program, except insofar as the audit and plan elements are consistent with source reduction, as defined in Section 25244.14, or

subsequent statutory definitions of pollution prevention. (Added by Stats. 1992, Ch. 1162, Sec. 3. Effective January 1, 1993.)

44394. Any facility operator who does not submit a complete airborne toxic risk reduction audit and plan or fails to implement the measures set forth in the plan as set forth in this chapter is subject to the civil penalty specified in subdivision (a) of Section 44381, and any facility operator who, in connection with the audit or plan, knowingly submits any false statement or representation is subject to the civil penalty specified in subdivision (b) of Section 44381. (Added by Stats. 1992, Ch. 1162, Sec. 3. Effective January 1, 1993.)

# Appendix C

# Asbestos Quantity Conversion Factors

# Appendix C

## Asbestos Quantity Conversion Factors

### *A. "PCM" versus "TEM"*

Two main analytical methods have been used for the analysis of asbestos samples: phase contrast microscopy (PCM), the primary method used historically to analyze asbestos samples, and transmission electron microscopy (TEM), the current state-of-the-art method.

PCM analysis has been preferred in the past over TEM because it can be done more quickly and it is less expensive. One major limitation of PCM analysis, however, especially in outdoor environments, is that the analyst cannot distinguish asbestos from non-asbestos fibers, such as cellulose, talc, or gypsum. Also, PCM cannot detect fibers that have a diameter of about 0.3 microns or less, which could substantially underestimate the asbestos fiber concentrations. These limitations make PCM impractical for the analysis of ambient asbestos samples.

Transmission electron microscopy (TEM) is the preferred analytical method for outdoor asbestos samples because of its ability to detect small fibers (greater than or equal to 0.0002 microns in diameter) and to distinguish between asbestos fibers and non-asbestos fibers. The term "TEM structures" is often used to describe asbestos fibers detected by this method. TEM is the method recommended by the Office of Environmental Health Hazard Assessment (OEHHA). TEM measurements cannot be directly related to the risk potency factors, however, because the studies upon which OEHHA's risk assessment was based used the less expensive PCM analysis. The TEM measurements must be converted to PCM-equivalent units, using the following equation (ARB, 1990):

$$1\,\text{PCM fiber} = 320\,\text{TEM structures}$$

### *B. Asbestos Inhalation Cancer Potency Factor*

The unit risk factor for asbestos fibers is $1.9 \times 10^{-4}$ in units of $(100\ \text{PCM fibers/m}^3)^{-1}$ and the unit risk factor is $6.3 \times 10^{-2}$ in units of $(\mu\text{g/m}^3)^{-1}$. The unit risk factor is based on epidemiological studies in which PCM fiber measurements were used. These unit risk factors are listed in Chapter 7 and in the Asbestos Toxic Air Contaminant (TAC) identification document (CDHS, 1986) and in OEHHA, 1999b. These asbestos cancer potency factors are for mesothelioma. Since these cancer potency factors are in units of concentration or dose, complications arise when the emitted asbestos quantities are reported in mass units (pounds/year and maximum pounds/hour) for the Air Toxics Hot Spots Program (Hot Spots).

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

The TAC inhalation cancer potency factor has been converted from mass to concentration using a factor of 0.003 µg asbestos = 100 asbestos PCM fibers. This conversion has been derived from information published by the United States Environmental Protection Agency (U.S. EPA) (U.S. EPA, 1986). The number of asbestos PCM fibers associated with a given mass of asbestos can vary appreciably. Also, U.S. EPA has stated that this conversion factor is the geometric mean of measured relationships between optical fiber counts and mass airborne chrysotile in several published studies, that the range of the conversion factor between the different studies is large (0.0005 - 0.015 µg asbestos/100 asbestos PCM fibers), and that the factor carries with it an appreciable uncertainty.

The current recommendation for Hot Spots risk assessments uses a default breathing rate of 393 L/day-kg body weight for a 70 year exposure duration. A dose is calculated from the ground level concentration using the following equation:

$$X\ (\mu g/m^3) \times 393\ L/day\text{-}kg\ body\ weight \times 10^{-6} = dose\ (mg/kg\text{-}day)$$

The $10^{-6}$ term converts the L in the breathing rate to $m^3$ and the µg in the air concentration term to mg.

In order to obtain cancer risk the dose is subsequently multiplied times the cancer potency factor as follows:

Dose (mg/kg-body weight) x cancer potency factor (mg/kg-body weight) = Cancer risk (unitless)

For risk communication purposes cancer risk may be converted into chances per million of developing cancer. This terminology is often more clearly understood by the public than cancer risk.

Cancer risk x ($1 \times 10^6$) = chances per million of developing cancer

The cancer potency factor $(mg/kg\ body\ weight)^{-1}$ may be calculated from the fiber cancer potency factor using the relationship of 0.003 µg = 100 fibers PCM, 70 kg body weight, 20 $m^3$ breathed per day, and a factor of 1000 to convert µg asbestos into mg:

$$1.9\times10^{-4}\left(100\ PCM\ \ fibers/m^3\right)^{-1}\times\frac{70kg}{20m^3}\times\frac{1000}{0.003mg/100\ fibers}=2.2\times10^{+2}\left(mg/kg\ body\ weight\right)^{-1}$$

The ISCST3 air dispersion modeling program estimates concentrations in units of $\mu g/m^3$ based on emission estimates in lb/yr. If the ground level concentrations are derived from PCM fiber measurements, then no additional uncertainty is introduced by the conversion to µg using the factor of 0.003. This is because the factor is effectively cancelled out by its use to derive the cancer potency factor in $(mg/kg\ body\ weight)^{-1}$. There is a slight rounding error that may be introduced.

References

ARB, 1990. Proposed Control Measure for Asbestos-Containing Serpentine Rock in Surfacing Applications, Technical Support Document, Air Resources Board, February 1990.

CDHS, (1986) California Department of Health Services (CDHS) 1986. Report to the Air Resources Board on Asbestos. Part B. Health Effects of Asbestos. Epidemiological Studies Section, Berkeley, CA.

OEHHA. (1999b). Air Toxics Hot Spots Program Risk Assessment Guidelines. Part II. Technical Support Document for Describing Available Cancer Potency Factors. Available online at http://www.oehha.ca.gov

USEPA, 1986. Airborne Asbestos Health Assessment Update. EPA/600/8-84/003F, Office of Health and Environmental Assessment, Washington, DC.

# Appendix D

# Risk Assessment Procedures to Evaluate Particulate Emissions from Diesel-Fueled Engines

# Appendix D

# Risk Assessment Procedures to Evaluate Particulate Emissions from Diesel-Fueled Engines

## A. Introduction

The objective of this appendix is to discuss procedures for estimating potential cancer and noncancer health risk from exposure to particulate matter (PM) emissions from diesel-fueled engines (diesel exhaust). It will also clarify the requirements and recommendations for acute noncancer and multipathway cancer and chronic risk assessment for diesel PM. In addition to the notification and risk reduction requirements under the Hot Spots Program, this appendix should facilitate the use of the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (ARB, 2000) (Diesel Guidelines). The Diesel Guidelines were developed by the Air Resources Board (ARB) with assistance from the Office of Environmental Health Hazard Assessment (OEHHA) in October 2000. The Diesel Guidelines are intended to assist local Air Pollution Control and Air Quality Management Districts (Districts) and sources of diesel PM emissions in making consistent risk management decisions.

In advance of performing a health risk assessment (HRA), it is recommended that the District and the stationary source of diesel emissions reach a consensus on the HRA approach for estimating health impacts from diesel exhaust. See Chapter 9 for an outline of a modeling protocol.

## B. Calculations/Risk Assessment Procedures

In August 1998, the ARB identified diesel exhaust as a toxic air contaminant (TAC) (ARB, 1998). In the identification report, OEHHA provided an inhalation noncancer chronic reference exposure level (REL) of 5 micrograms per cubic meter ($\mu g/m^3$) and a range of inhalation cancer potency factors of $1.3 \times 10^{-4}$ to $2.4 \times 10^{-3}$ $(\mu g/m^3)^{-1}$. The Scientific Review Panel on Toxic Air Contaminants recommended a "reasonable estimate" inhalation unit risk factor of $3.0 \times 10^{-4}$ $(\mu g/m^3)^{-1}$. From the unit risk factor an inhalation cancer potency factor of 1.1 $(mg/kg\text{-}day)^{-1}$ may be calculated. These noncancer and cancer health factors were developed based on whole (gas and particulate matter) diesel exhaust. The surrogate for whole diesel exhaust is diesel PM. $PM_{10}$ (particulate matter, ten microns or less in size) is the basis for the potential risk calculations.

### Cancer

When conducting an HRA, the potential cancer risk from inhalation exposure to diesel PM will outweigh the potential noncancer health impacts. Therefore, inhalation cancer risk is required for every HRA. (The methods for calculating inhalation cancer risk can be found in Chapters 5, 7, and 8.) When comparing whole diesel exhaust to speciated diesel exhaust (e.g., PAHs, metals), potential cancer risk from inhalation exposure to whole diesel exhaust will

outweigh the multipathway cancer risk from the speciated components. For this reason, there will be few situations where an analysis of multipathway risk is necessary.

The District may elect to require a multipathway analysis if reliable data are available and the District decides that it is necessary. If the District elects to require a multipathway analysis, the components of the diesel exhaust will need to be speciated since there is not an oral cancer potency factor for diesel PM. It is recommended that the District be consulted on the procedures for conducting a multipathway analysis for diesel exhaust. The District may wish to use speciation data from the ARB. If so, a resource for speciation data is available on the ARB's website at www.arb.ca.gov/emisinv/speciate/speciate.htm.

If a multipathway analysis is required, the speciated data should be compared with the substances in Table 5.1. Any substances in the speciation profile that are listed in Table 5.1 and have an oral cancer potency factor in Table 7.1 should be included in the multipathway analysis. Potential multipathway cancer risks are estimated following the procedures in Chapters 5 and 8 of this document. These procedures require summing the potential cancer risk from each carcinogen to estimate the total facility cancer risk.

**Noncancer Chronic**

To determine noncancer chronic inhalation health impacts from exposure to diesel exhaust use the methods described in Chapters 6 and 8.

In most situations, noncancer health impacts from inhalation exposure to whole diesel exhaust will outweigh the noncancer multipathway health impacts to the speciated components of diesel exhaust. However, there may be situations when the multipathway impacts need to be investigated.

Therefore, the District may elect to require a multipathway analysis if reliable data is available and they feel it is necessary. If the District elects to require a multipathway analysis, the components of the diesel exhaust will need to be speciated since there is not an oral reference exposure level for diesel PM. A resource for speciation data at the ARB is identified above. It is recommended that the District be consulted on the procedures for conducting a multipathway analysis. If a multipathway analysis is required, the speciated data should be compared with the substances in Table 5.1. Any substances in the speciation profile that are listed in Table 5.1 and have an oral chronic REL in Table 6.3 should be included in the multipathway analysis. Potential multipathway chronic risks are estimated following the procedures in Chapters 5 and 8 of this document.

**Noncancer Acute**

As stated above, potential cancer risk is usually the driving health impact for diesel exhaust. However, there may be certain unusual situations where an evaluation of the acute health effects may be warranted. One possible situation is when a nearby receptor is located above the emission release point (e.g. on a hillside or in a multistory apartment building). Since there is no acute REL for diesel exhaust, the components of the exhaust will need to be speciated to determine the potential acute health impacts. It is recommended that the District be consulted on the procedures for conducting an acute analysis. If an acute analysis is required, the speciated

data should be compared with the substances in Table 6.1. Any substances in the speciation profile that are listed in Table 6.1 should be included in the acute analysis. A resource for speciation data at the ARB is identified above. Potential acute risks are estimated following the procedures in Chapters 6 and 8 of this document.

**References:**

ARB 1998. Air Resources Board, "Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Appendix III, Part A, Exposure Assessment," April 1998.

ARB 2000. Air Resources Board, "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles," October 2000.

# Appendix E

# Toxicity Equivalency Factors for Polychlorinated Dibenzo-*p*-Dioxins Dibenzofurans And Polychlorinated Biphenyls

# Appendix E

## Toxicity Equivalency Factors for Polychlorinated Dibenzo-*p*-Dioxins Dibenzofurans and Polychlorinated Biphenyls

### Introduction

Dioxins and furans vary considerably in their potency for causing both cancer and noncancer health impacts. A facility may choose to speciate dioxin and furan emissions in order to obtain a more accurate picture of the risks. A scheme, based on both cancer and noncancer toxicity studies, has been developed to relate the potency of various dioxin and furan congeners to the potency of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. A detailed explanation of the World Health Organization's 1997 Toxicity Equivalents Factor ($WHO_{97}$-TEF) (van den Berg, 1998) scheme, the latest scheme adopted by OEHHA, is available in OEHHA (2003).

The individually calculated inhalation or oral doses of each dioxin or furan congener may be multiplied times the oral or inhalation cancer potency for each individual congener listed in Table 7.1. In order to determine the inhalation chronic hazard index, the ground level concentration of each congener may be divided by the chronic REL for each congener in Table 6.2 and the hazard quotients may be summed to give the hazard index for dioxins and furans. The oral chronic hazard quotient may be calculated by determining the oral dose of each congener and dividing by the individual chronic oral REL for each congener. The oral hazard quotients may be summed to give the hazard quotient for oral noncancer dioxin risks and may then be added to the inhalation hazard index to give the combined inhalation and oral chronic hazard quotient for dioxins.

A second equivalent procedure may also be used to calculate the cancer risk of a mixture of dioxin and furan congeners. The concentration of each congener listed in Table E-1 is multiplied by the $WHO_{97}$-TEF for that congener. For example, for 1,2,3,4,7,8-hexachlorodibenzodioxin the concentration ($\mu g/m^3$) may be multiplied by 0.1 to give the concentration equivalent to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. 2,4,7,8-tetrachlorodibenzodioxin would be multiplied by zero indicating no cancer or noncancer toxicity. The 2,3,7,8-tetrachlorodibenzo-*p*-dioxin equivalent concentrations may be summed and treated as if the total concentration were 2,3,7,8-tetrachlorodibenzo-*p*-dioxin for the purposes of calculating cancer and noncancer risks. Thus, the potency adjusted ground level concentration can be multiplied by the breathing rate to give dose (see equation 5.4.1), and then multiplied times the cancer potency factor for 2,3,7,8- tetrachlorodibenzo-*p*-dioxin (Table 7.1) to give cancer risk for the entire mixture. If a noncancer chronic hazard index needs to be calculated the potency adjusted ground level concentration can be divided by the chronic reference exposure level for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin to give a hazard index for the entire mixture. The TEF may be multiplied times the individual congener dose calculated for the inhalation and oral cancer risk calculation, and the oral chronic hazard index determination.

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

The most recent TEF scheme adopted by OEHHA includes TEF for individual PCB congeners (see Table E-1) (OEHHA, 2003). These are the congeners that have dioxin-like biological effects. The same procedures as described above may be used to calculate the concentration or dose of these congeners. Where data are available on individual PCB congeners emitted by a facility, then these TEFs are to be used. If Table E1 is used to adjust the dose or concentration of the individual PCB congeners, the 2,3,7,8-tetrachlorodibenzo-*p*-dioxin oral and inhalation cancer potency factors should be used to determine cancer risk. The chronic inhalation and oral REL for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin should be used to determine the noncancer chronic hazard index. If only total PCB data are available, then the PCB slope factors provided in Table 7.1 can be used for cancer risk determination.

## Table E1. WHO/97 Toxic equivalency factors (TEFs)

| Congener | | $TEF_{WHO-97}$ |
|---|---|---|
| **PCDDs** | | |
| 2,3,7,8-TCDD | | 1 |
| 1,2,3,7,8-PeCDD | | 1 |
| 1,2,3,4,7,8-HxCDD | | 0.1 |
| 1,2,3,7,8,9-HxCDD | | 0.1 |
| 1,2,3,6,7,8-HxCDD | | 0.1 |
| 1,2,3,4,6,7,8-HpCDD | | 0.01 |
| 1,2,3,4,6,7,8,9-OCDD | | 0.0001 |
| **PCDFs** | | |
| 2,3,7,8-TCDF | | 0.1 |
| 1,2,3,7,8-PeCDF | | 0.05 |
| 2,3,4,7,8-PeCDF | | 0.5 |
| 1,2,3,4,7,8-HxCDF | | 0.1 |
| 1,2,3,7,8,9-HxCDF | | 0.1 |
| 1,2,3,6,7,8-HxCDF | | 0.1 |
| 2,3,4,6,7,8-HxCDF | | 0.1 |
| 1,2,3,4,6,7,8-HpCDF | | 0.01 |
| 1,2,3,4,7,8,9-HpCDF | | 0.01 |
| 1,2,3,4,6,7,8,9-OCDF | | 0.0001 |
| **PCBs** (IUPAC #, Structure) | | |
| 77 | 3,3',4,4'-TCB | 0.0001 |
| 81 | 3,4,4',5-TCB | 0.0001 |
| 105 | 2,3,3',4,4'-PeCB | 0.0001 |
| 114 | 2,3,4,4',5-PeCB | 0.0005 |
| 118 | 2,3',4,4',5-PeCB | 0.0001 |
| 123 | 2',3,4,4',5-PeCB | 0.0001 |
| 126 | 3,3',4,4',5-PeCB | 0.1 |
| 156 | 2,3,3',4,4',5-HxCB | 0.0005 |
| 157 | 2,3,3',4,4',5'-HxCB | 0.0005 |
| 167 | 2,3',4,4',5,5'-HxCB | 0.00001 |
| 169 | 3,3',4,4',5,5'-HxCB | 0.01 |
| 189 | 2,3,3',4,4',5,5'-HpCB | 0.0001 |

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

References

OEHHA, 2003. Technical Support Document for Describing Available Cancer Potency Factors, Appendix A (revised August, 2003) : Use of the Revised Toxicity Equivalency Factor ($TEF_{WHO-97}$) Scheme for Estimating Toxicity of Mixtures of Dioxin-Like Chemicals, September 2003. Available at **www.oehha.ca.gov**.

van den Berg, M., Birnbaum, L., Bosveld, A. T. C., Brunstrom, B., Cook, P., Feeley, M., Giesy, J. P., Hanberg, A., Hasegawa, R., Kennedy, S. W., Kubiak, T., Larsen, J. C., Van Leeuwen, F. X. R., Liem, A. K. D., Nolt, C., Peterson, R. E., Poellinger, L., Safe, S., Schrenk, D., Tillitt, D., Tysklind, M., Younes, M., Waern, F., and Zacharewski, T. (1998). Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. Environ. Health Perspec. **V106**, 775-792.

# Appendix F

# Overview of the Lead Risk Assessment Procedures

# Appendix F

## Overview of the Lead Risk Assessment Procedures

## I. Introduction

The objective of this appendix is to provide a method for estimating potential cancer and noncancer health effects due to airborne lead exposure. This appendix should facilitate the use of the *Risk Management Guidelines for New, Modified, and Existing Sources of Lead* (Lead RM Guidelines) (ARB, 2001) for analysis of lead exposure. The Lead RM Guidelines were developed by the Air Resources Board (ARB) with assistance from Office of Environmental Health Hazard Assessment (OEHHA) and Department of Health Services (DHS) in March 2001 to assist local air districts and sources of lead in making consistent risk management decisions for new, modified, and existing sources of lead.

In April 1997, the ARB identified inorganic lead as a toxic air contaminant (TAC) (ARB, 1997). Lead is unique among other TACs identified by ARB in several ways. First, infants and children are particularly susceptible to the health effects of lead, and the risk assessment is based on health effects in children. Second, the chronic noncancer effects are related to blood lead levels (BLLs) as opposed to ambient air concentrations. These BLLs reflect current and past exposure from a number of sources; air emissions may only be a small part of the total exposure. Third, based on recommendations of the OEHHA and the Scientific Review Panel on Toxic Air Contaminants (SRP), the ARB did not identify a threshold level for chronic noncancer health effects due to lead exposure. Threshold levels are levels below which no adverse health effects are expected to occur. Since acute or chronic Reference Exposure Levels (RELs) are based on threshold levels, none were developed for lead. Thus, a hazard index approach is not used for lead. Instead, air concentrations are compared to defined air lead levels associated with specified percentages of children with BLL $\geq$ 10 μg/dL. Acceptable risk is based on minimizing the number of children at or above a BLL of 10 μg/dL.

## II. Methods for Estimation of Health Risk Effects

Methods for estimating site-specific noncancer and cancer potential health impacts from exposure to lead emissions are given in the Lead RM Guidelines. The noncancer health effects pose greater public health significance than the cancer health effects. Minimizing noncancer health effects of lead will therefore also minimize cancer health effects.

Chronic noncancer health risks are estimated based on neurodevelopmental health risks to children and would also be protective of adults. These health effects can be evaluated using a tiered approach based on blood lead level distribution in the population.

Potential multipathway cancer risks are estimated following the procedures in Chapters 5 and 8 of this document. These procedures require summing individual cancer risk from each carcinogen to estimate the total facility cancer risk.

In advance of performing a health risk assessment (HRA), it is recommended that the Air Pollution Control or Air Quality Management District (District) and the stationary source of lead air emissions reach a consensus on the HRA approach for estimating chronic noncancer and cancer health risks. See Chapter 9 for an outline of a modeling protocol.

## A. Tiered Approach for Estimating Noncancer Risks due to Lead Exposure

The Lead Risk Management Guidelines provide three tiers of analysis to determine baseline BLL distributions for estimating risk. Although there is a simple risk management option provided in the Lead RM Guidelines, in a risk assessment for the Air Toxics Hot Spots program one of the following tiers must be used to report estimates of the percent of children estimated to be above 10 μg/dL blood lead. The tiered approach is based on an assessment of neurodevelopmental risk, with the BLL distribution in the population as the most significant factor. The BLL distribution consists of two components: 1) the baseline BLL distribution due to all sources of exposure; and 2) the exposure due to emissions from a facility.

Tier I is a default approach that requires minimal site-specific information on concentrations of lead in environmental media other than air. Tier I uses two default BLL distributions, one for a high exposure scenario and one for an average exposure scenario. The exposure scenario is determined using the median age of the homes in the census tract and the ratio of area income to the poverty level. The default baseline BLL distribution for each of the exposure scenarios is based on a review of neighborhood and community blood lead studies. The assessor determines the 30-day average lead concentration due to the facility averaged over the 1 square kilometer area centered on the Maximum Offsite Concentration (MOC). The percentage of children with BLLs greater than or equal to 10 micrograms per deciliter (≥ 10 μg/dL) is determined using Table F-1 (also found on page 17 in the Lead RM Guidelines), the air lead concentration, and the determined exposure scenario. The 10 μg/dL threshold level has been identified by the Centers for Disease Control and Prevention (CDC) as a level where potential health effects may occur. The public health goal of management practices should be to implement procedures/practices to prevent BLLs at or above this level. The estimated percentage of children with BLLs ≥ 10 μg/dL is then used with risk management levels given in Chapter III, Section D of the Lead RM Guidelines to assist in making risk management decisions.

**Table F-1 Percentage of Children with Blood Lead Levels ≥ 10 μg/dl for Various Air Lead Concentrations at Two Exposure Scenarios**

| Air Lead Concentration in the Maximum Exposure Area (30-day average) [μg/m$^3$] | Percent ≥ 10 μg/dL | |
|---|---|---|
| | High Exposure Scenario | Average Exposure Scenario |
| Baseline* | 5.1 | 1.2 |
| 0.02 | 5.4 | 1.4 |
| 0.06 | 6.1 | 1.7 |
| 0.10 | 6.8 | 2.2 |
| 0.20 | 8.9 | 3.4 |
| 0.25 | 9.8 | 4.1 |
| 0.50 | 15.9 | 8.9 |
| 0.75 | 22.4 | 15.4 |
| 1.0 | 29.1 | 23.0 |
| 1.5 | 42.5 | 39.0 |

* The baseline represents BLLs due to lead in soil, dust, water, food, and background air lead concentrations.

Tier II requires the development of site-specific baseline BLL distributions within the impacted population using site-specific estimates of lead levels in environmental media, including soil, dust, water, and/or food, using the U.S. EPA Integrated Exposure Uptake Biokinetic (IEUBK) model. The IEUBK model calculates the probability of an individual exceeding a specific BLL based on site-specific information. The aggregate of the individual BLLs is used to estimate the neurodevelopmental risk in the maximum exposure area. A detailed discussion of this tier is beyond the scope of this overview; see Appendix D in the Lead RM Guidelines for a discussion of the IEUBK model and its use.

Tier III involves actual blood lead sampling of the population impacted by the facility to define the baseline BLLs. In Tier III, the facility is responsible for conducting BLL testing to establish a site-specific BLL distribution. The Lead RM Guidelines recommend the neurodevelopmental risk be calculated as the probability of children in an affected exposure area having a BLL ≥ 10 μg/dL using the results of the blood lead sampling. It is highly unlikely that this option would be used due to the cost incurred and the fact that the sampled population must consent to the sampling and an appropriate sampling strategy must be developed to adequately characterize the blood lead levels of the impacted population.

For further information on the tiered approach using the Tier I, Tier II, or Tier III, please see Chapter II of the *ARB Risk Management Guidelines for New, Modified, and Existing Sources of Lead* (ARB, 2001). This document can be downloaded from the ARB web site at *http://www.arb.ca.gov/toxics/lead/lead.htm* or can be requested by calling (916) 323-4327.

## B. Methods for Estimating Potential Cancer Risks due to Lead

While lead has a unique noncancer assessment methodology, the determination of potential multipathway cancer risk is the same as other carcinogens. Chapters 5, 7, and 8, and Appendices I and L provide all the needed information for calculating potential cancer risk. The health risk assessment should report the multipathway cancer risks from lead emissions.

Chapter III in the Lead RM Guidelines provides methods for determining risk management of lead exposure, using the results from the cancer risk calculation, and the local District's defined significance levels.

## III. References

ARB, 1997. Proposed Identification Inorganic Lead as a Toxic Air Contaminant, Parts A, B, C. California Air Resources Board. April, 1997.

ARB, 2001. ARB Risk Management Guidelines for New, Modified, and Existing Sources of Lead. California Air Resources Board. March 2001

# APPENDIX G

## PAH Potency Factors and Selection of Potency Equivalency Factors (PEF) for PAHs Based on Benzo[*A*]Pyrene Potency

# Appendix G

## PAH Potency Factors and Selection of Potency Equivalency Factors (PEF) for PAHs based on Benzo(*a*)pyrene Potency

Benzo(a)pyrene (BaP) was chosen as the primary representative of the class of polycyclic aromatic hydrocarbons (PAHs) because of (1) the large amount of toxicological data available on BaP (versus the relatively incomplete database for other PAHs), (2) the availability of monitoring techniques for BaP, and (3) the significant exposure expected (and found). The Office of Environmental Health Hazard Assessment (OEHHA) has developed a Potency Equivalency Factor (PEF) procedure to assess the relative potencies of PAHs and PAH derivatives as a group. This procedure can address the impact of carcinogenic PAHs in ambient air since they are usually present together. This procedure was approved by the Scientific Review Panel (SRP) on Toxic Air Contaminants (TAC) as part of the Health Effects Assessment of Benzo(a)pyrene during the TAC identification process (OEHHA, 1993).

Due to the variety of data available on the carcinogenicity and mutagenicity of PAHs, an order of preference for the use of available data in assessing relative potency was developed. If a health effects evaluation and quantitative risk assessment leading to a cancer potency value had been conducted on a specific PAH, then those values were given the highest preference. Cancer potency values for PAHs developed by this process are shown in Table G-1.

**Table G-1: Potencies of PAHs and derivatives[1]**

| Chemicals | Cancer potency factors $(mg/kg\text{-}day)^{-1}$ | Unit risks $(\mu g/m^3)^{-1}$ |
|---|---|---|
| benzo[*a*]pyrene | 11.5 | $1.1 \times 10^{-3}$ |
| dibenz[*a*,*h*]anthracene | 4.1 | $1.2 \times 10^{-4}$ |
| 7,12-dimethylbenzanthracene | 250 | $7.1 \times 10^{-2}$ |
| 3-methylcholanthrene | 22 | $6.3 \times 10^{-3}$ |
| 5-nitroacenaphthene | 0.13 | $3.7 \times 10^{-5}$ |

1. Source: (OEHHA 1993; Collins *et al*., 1998). It is assumed that unit risks for inhalation have the same relative activities as cancer potencies for oral intake.

If potency values have not been developed for specific compounds, a carcinogenic activity relative to BaP, rather than a true potency, can be developed. These relative activity values are referred to as Potency Equivalency Factors or PEFs. For air contaminants, the relative potency to BaP based on data from inhalation studies would be optimal. Otherwise, intrapulmonary or intratracheal administration studies would be most relevant, since such studies are in the target organ of interest. Next in order of

preference is information on activity by the oral route and skin painting. Intraperitoneal and subcutaneous administration rank at the bottom of the *in vivo* tests considered useful for PEF development because of their lack of relevance to environmental exposures. Next, in decreasing order of preference, are genotoxicity data, which exist for a large number of compounds. In many cases genotoxicity information is restricted to mutagenicity data. Finally, there are data on structure-activity relationships among PAH compounds. Structure-activity considerations may help identify a PAH as carcinogenic, but at this time have not been established as predictors of carcinogenic potency.

Using this order of preference, PEFs were derived for 21 PAHs and are presented in Table G-2 (OEHHA, 1993: Collins *et al*., 1998).

**Table G-2. OEHHA PEF weighting scheme for PAHs and their resulting cancer potency values.**

| PAH or derivative | PEF | Unit Risk $(\mu g/m^3)^{-1}$ | Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$ | Oral Slope Factor $(mg/kg\text{-}day)^{-1}$ |
|---|---|---|---|---|
| **benzo[*a*]pyrene (index compound)** | **1.0** | **1.1E-3** | **3.9E+0** | **1.2E+1** |
| benz[*a*]anthracene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| benzo[b]fluoranthene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| benzo[*j*]fluoranthene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| benzo[k]fluoranthene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| dibenz[*a*,*j*]acridine | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| dibenz[*a*,*h*]acridine | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| 7H-dibenzo[c,*g*]carbazole | 1.0 | 1.1E-3 | 3.9E+0 | 1.2E+1 |
| dibenzo[*a*,*e*]pyrene | 1.0 | 1.1E-3 | 3.9E+0 | 1.2E+1 |
| dibenzo[*a*,*h*]pyrene | 10 | 1.1E-2 | 3.9E+1 | 1.2E+2 |
| dibenzo[*a*,*i*]pyrene | 10 | 1.1E-2 | 3.9E+1 | 1.2E+2 |
| dibenzo[*a*,*l*]pyrene | 10 | 1.1E-2 | 3.9E+1 | 1.2E+2 |
| indeno[1,2,3-*cd*]pyrene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| 5-methylchrysene | 1.0 | 1.1E-3 | 3.9E+0 | 1.2E+1 |
| 1-nitropyrene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| 4-nitropyrene | 0.1 | 1.1E-4 | 3.9E-1 | 1.2E+0 |
| 1,6-dinitropyrene | 10 | 1.1E-2 | 3.9E+1 | 1.2E+2 |
| 1,8-dinitropyrene | 1.0 | 1.1E-3 | 3.9E+0 | 1.2E+1 |
| 6-nitrochrysene | 10 | 1.1E-2 | 3.9E+1 | 1.2E+2 |
| 2-nitrofluorene | 0.01 | 1.1E-5 | 3.9E-2 | 1.2E-1 |
| chrysene | 0.01 | 1.1E-5 | 3.9E-2 | 1.2E-1 |

1. Source: OEHHA (1993)

The cancer potency comparisons show that some PAHs are more potent than BaP, while other PAHs analyzed were less or much less potent. These comparisons indicated that considering all PAHs to be equivalent in potency to BaP would likely overestimate the cancer potency of a PAH mixture, but such an assumption would be health protective and likely to be helpful in a screening estimate of PAH risks (OEHHA, 1993). If one

assumes that PAHs are as carcinogenic as they are genotoxic, then their hazard relative to BaP would be dependent on their concentration in the environment. In light of the limited information available on other PAHs, BaP remains an important representative or surrogate for this group of air pollutants.

Detailed descriptions on the criteria used for developing individual PEFs can be found in (OEHHA, 1999b) Currently, OEHHA is undertaking a review of all recent literature pertaining to the carcinogenicity and mutagenicity of PAHs. New cancer potency values for PAHs may be developed if an adequate health effects evaluation and quantitative risk assessment can be performed. Also, some current PEFs may be modified based on new data. Any changes to the potency values and PEFs for PAHs will be reflected in the HARP program when they occur. It is incumbent on the risk assessor to access the most recent version of the HARP program to ensure that the most up-to-date PAH potency values are used.

**References**

Collins, J.F., Brown, J.P., Alexeeff, G.V., and Salmon, A.G. 1998. Potency equivalency factors for some polycyclic aromatic hydrocarbons and polycyclic aromatic hydrocarbon derivatives. Regul. Toxicol. Pharmacol. 28:45-54.

OEHHA, 1993. Benzo[*a*]pyrene as a Toxic Air Contaminant. Part B. Health Effects of Benzo[*a*]pyrene. Air Toxicology and Epidemiology Section, Berkeley, CA.

OEHHA, 1999b. The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part II. Technical Support Document for Describing Available Cancer Potency Factors, Office of Environmental Health Hazard Assessment, April 1999.

# Appendix H

## Recommendations for Estimating Concentrations of Longer Averaging Periods from the Maximum One-Hour Concentration for Screening Purposes

# Appendix H

# Recommendations for Estimating Concentrations of Longer Averaging Periods from the Maximum One-Hour Concentration for Screening Purposes

## A. Introduction

The U.S. Environmental Protection Agency (U.S. EPA) SCREEN3 air dispersion model is frequently used to estimate the maximum one-hour concentration downwind due to emissions from a point source to assess impacts from a source. The SCREEN3 model results (or ISCST3 with screening meteorological data), in conjunction with the U.S. EPA screening factors, are frequently used to estimate concentrations for longer averaging periods, such as the maximum annual average concentration. In addition, it is permissible to use the ISCST3 air dispersion model in a screening mode with identical meteorological conditions as used in the SCREEN3 model to superimpose results from multiple sources.

This method to assess short-term and long-term impacts may be used as a first-level screening indicator to determine if a more refined analysis is necessary. In the event that representative meteorological data are not available, the screening assessment may be the only computer modeling method available to assess source impacts.

In California, this standard procedure will generally bias concentrations towards over prediction in most cases when the source is a continuous release. However, in the case when a source is not continuous, these screening factors may not be biased towards over prediction. In this case, we recommend an alternative procedure for estimating screening value concentrations for longer averaging periods than one-hour for intermittent releases.

## B. Current Procedures

The current screening factors used to estimate longer term averages (i.e., 3-hour, 8-hour, 24-hour, 30-day, and annual averages) from maximum one-hour concentrations in California are shown in Table H.1 and Figure H.1. The factors are U.S. EPA recommended values with the exception of the 30-day factor. The 30-day factor is an ARB recommended value (ARB, 1994). The maximum and minimum values are recommended limits to which one may diverge from the general (Rec.) case, (U.S. EPA, 1992). Diverging from the general case should only be done on a case by case basis with prior approval from the reviewing agency.

## C. Non-Standard Averaging Periods with a Continuous Release

The following is the ARB recommendation for estimating screening concentrations for non-standard averaging periods that are not listed in Table H.1 or Figure H.1. Specifically, the recommendation is for estimating screening concentrations for 4-hour, 6-hour, and 7-hour averaging periods.

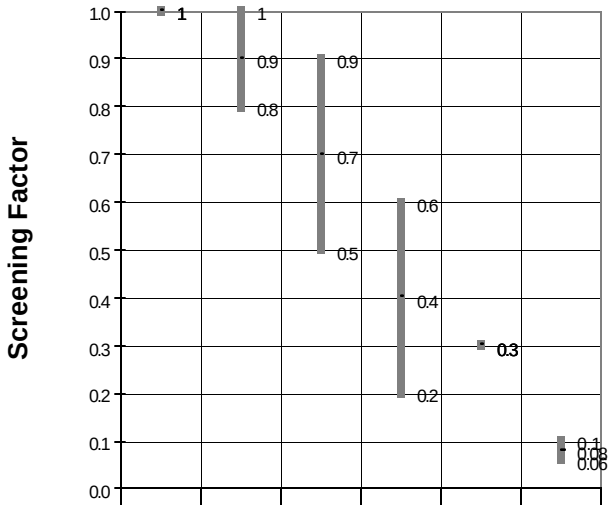
The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

The current U.S. EPA screening factors applicable to standard averaging periods should be used for non-standard averaging periods. Specifically for the 4-hour, 6-hour, and 7-hour averaging periods, we recommend that the 3-hour screening factor of (0.9± 0.1) be used. The following illustrates the method to estimate a 6-hour average concentration from a continuous release from a single point source:

1. determine the maximum 1-hour concentration according to standard screening procedures ($C_{max1\text{-}hr}$),
2. scale the maximum 1-hour concentration by (0.9±0.1), and
3. the result is the maximum 6-hour concentration ($C_{max6\text{-}hr}=C_{max1\text{-}hr}$ *(0.9±0.1)).

In the case for the 6-hour and 7-hour average concentration estimates, the user may wish to take the lower bound of (0.9±0.1), or 0.8. For the 4-hour average estimate, we recommend the user to use the 3-hour factor as is, 0.9.

**Figure H.1**
**Screening Factors to Convert**
**1-hr Max. to Longer Avg. Periods**




| | 1-hr | 3-hr | 8-hr | 24-hr | 30-day | Annual |
|---|---|---|---|---|---|---|
| Max | 1 | 1 | 0.9 | 0.6 | 0.3 | 0.1 |
| Min | 1 | 0.8 | 0.5 | 0.2 | 0.3 | 0.06 |
| Rec | 1 | 0.9 | 0.7 | 0.4 | 0.3 | 0.08 |

Averaging Period

**Table H.1 Recommended Factors to Convert Maximum 1-hour Avg. Concentrations to Other Averaging Periods (U.S. EPA, 1992; ARB, 1994).**

| Averaging Time | Range | Typical Recommended |
|---|---|---|
| 3 hours | 0.8 - 1.0 | 0.9 |
| 8 hours | 0.5 - 0.9 | 0.7 |
| 24 hours | 0.2 - 0.6 | 0.4 |
| 30 days | 0.2 - 0.3 | 0.3 |
| Annual | 0.06 - 0.1 | 0.08 |

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

Table H.2 summarizes these recommendations for the non-standard averaging periods.

**Table H.2 Recommended Factors to Convert Maximum 1-hour Avg. Concentrations to Non-Standard Averaging Periods.**

| Averaging Time | Range | Typical Recommended |
|---|---|---|
| 4 hours | 0.8 - 1.0 | 0.9 |
| 6 hours | 0.8 – 1.0 | 0.8 |
| 7 hours | 0.8 – 1.0 | 0.8 |

## D. Definitions

It is convenient to define the following terms relating to sources with respect to the duration of the release.

- Continuous Release – this is a release that is continuous over the duration of a year. An example of this type of release would be fugitive emissions from a 24-hour per day, 7-day per week operation or an operation that is nearly continuous.

- Intermittent Release – many emissions fall under this category. These are emission types that are not continuous over the year. Any operation that has normal business hours (e.g., 8 am to 6 pm) would fall into this category.

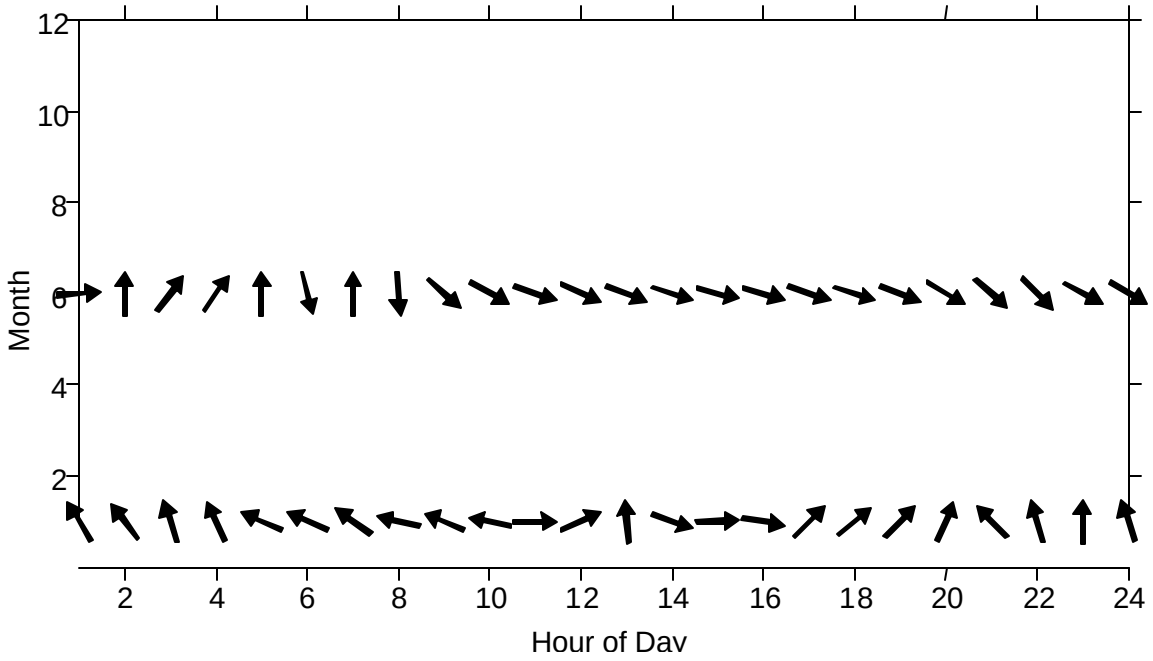
- Systematic Release – these are intermittent releases that occur at a specific time of the day. As an example, these type of releases can occur when a process requires clean out at the end of the work day. Thereby releasing emissions only at the end of the workday systematically. Systematic releases are similar to intermittent releases with a shorter duration during the normal operating schedule.

- Random Release – these are intermittent releases that can occur any time during the operating schedule. An example of this type of release would be of the type that depends on batch processing. For example, a brake shop may emit pollutants only when the brakes are cleaned which happens randomly throughout the normal business hours.

## E. Screening Factors

The U.S. EPA screening factors, as shown in Table H.1, compensate for the effects of varying conditions of wind speed, wind direction, ambient temperature, atmospheric stability, and mixing height over longer averaging periods, even though it is not explicitly indicated in the U.S. EPA Guidance (U.S. EPA, 1992). Figure H.2 shows the variability in wind direction over a 24-hour period. The data are averaged for two seven-day periods from data collected at Los Angeles International Airport (LAX). Figure H.2 was compiled for data collected in 1989 for January 1 to January 7 and June1 through June 7, 1989. The ordinate in Figure H.2 shows the months of the year. Only two months are plotted. The abscissa shows the hour of the day.

**Figure H.2**
**Hourly Wind Direction - Los Angeles**
**January (bottom – 1) and June (top - 6)**




As seen in Figure H.2, the wind direction changes throughout all hours of the day. In addition, the wind direction for LAX, in the overnight and early morning hours, can vary from January to June. During the afternoon hours of 1400 – 1600, the wind direction is similar in both months of January and June.

The standard U.S. EPA screening factor to estimate the maximum 24-hour concentration from the maximum 1-hour concentration is 0.4, as seen in Table H.1. Figure H.2 shows that for 15 of 24 hours the wind blows from the west-northwest during June. A 24-hour screening factor could be 0.6 (0.6 ≈ 15hrs/24hrs) based on wind direction alone. This is consistent with the upper bound of the adjustment factors shown in Table H.1. Including the variability for wind speed, ambient temperature, and atmospheric stability could further reduce the estimated scaling factor of 0.6 closer towards the U.S. EPA recommended value of 0.4.

## F. Intermittent Release

Support for the U.S. EPA screening factor is demonstrated for a continuous release (i.e., 24 hours per day) in the description above. It is important to be cautious when applying the U.S. EPA screening factors to an intermittent source for the purposes of estimating an annual average concentration (e.g., a business that may only emit during normal operating hours of 8 am to 6 pm).

Intermittent emissions, such as those from burning barrels, testing a standby diesel generator, or any normal business hour operation (e.g., 8am to 6pm Monday through Friday), could have the effect of eliminating some of the annual variability of meteorological conditions. For example, emissions only during the daytime could eliminate the variability of a drainage flow pattern in mountainous terrain. Guidance for estimating long-term averages for a screening approach and intermittent emissions is not available.

For a source located in the LAX meteorological domain, an emission pattern confined to the hours of 1400 to 1600 would eliminate any variability associated with the wind direction. In this case, estimating a 24-hour average with the U.S. EPA scaling factor of 0.4 would be incorrect.

In the event the emissions are intermittent but randomly distributed throughout the day, the scaling factor of 0.4 may be appropriate because the natural diurnal variability of meteorological conditions are concurrent with emissions. An additional pro-rating of the concentration, when estimating a 24-hour concentration, would be required to discount due to the intermittent nature of the emissions.

We recommend the following steps to estimate a screening based estimate of annual average concentrations from intermittent emissions.

1. Estimate the maximum one-hour concentration ($c_{1\text{-hr}}$) based on the SCREEN3 model approach (or similar, e.g., ISCST3 with screening meteorological data) for possible meteorological conditions consistent with the operating conditions and the actual hourly emission rate. It is acceptable to estimate downwind concentrations using all meteorological combinations available to SCREEN3. However, it is possible to be selective for the choices of meteorological conditions and still be conservative. For example, daytime only emissions need not be evaluated for nighttime stable atmospheric conditions (Pasquill-Gifford classes A through D are unstable and neutral atmospheric conditions applicable during the day. Classes D through F are neutral and stable atmospheric conditions applicable during the night.)

2. Estimate the concentration for the longest averaging period applicable based on the length of time of the systematic or randomly distributed emissions and the factors in Table H.1. For example, the longest averaging period concentration that may be estimated with the U.S. EPA scaling factors is an 8-hour concentration ($c_{8\text{-hr}}$) for emissions that are systematically released for 12 hours. Scaling factors between 8-hours and 12-hours are not available. In the case of the 8-hour concentration, the U.S. EPA screening factor of $0.7 \pm 0.2$ to estimate the maximum 8-hour concentration is appropriate.

   The U.S. EPA Screening Guidance allows for deviation from the suggested conversion factor on a case-by-case basis. We recommend the lower end of the range for the conversion factor (i.e., 0.5 for the 8-hour average) when estimating an annual average concentration. This is because variability associated with seasonal differences in wind speed, wind direction, and atmospheric stability would not be addressed otherwise. As seen in Figure H.2, there are seasonal differences in the wind direction.

For example, if X is the length of time of systematic or randomly distributed emissions, the following scalars can apply.

- $X \leq 2$ hrs; Scalar = 1.0 to estimate a 1-hour average
- 3 hrs $\leq X \leq$ 7 hrs; Scalar = 0.8 to estimate a 3-hour average
- 8 hrs $\leq X \leq$ 20 hrs; Scalar = 0.5 to estimate an 8-hour average (the selection of 20 hours is arbitrary)
- 21 hrs $\leq X \leq$ 24 hrs; this may be a continuous release, use standard screening procedures.

3. Estimate the annual average concentration ($c_{annual}$) by assuming the longer averaging period estimated above is persistent for the entire year. In the above example the 8-hour concentration is assumed to be persistent for an entire year to estimate an annual average concentration (i.e., the annual average concentration is assumed to be equal to the 8-hour concentration).

   In addition, the annual average concentration should be pro-rated over the final averaging period based on the pro-rated emissions (i.e., the calculation should include the fact that for some hours over the year, the emission rate is zero).

   For example, if Y is the number of operating hours in the year (e.g., Y = X * 365), the following may apply.
   $(c_{annual}) = (c_{1\text{-}hr})$ (Scalar) (Y/8760hrs/yr)

4. The hourly emission rate should be calculated based on the assumed operating schedule in the steps above. An example for a facility operating Y hours per year follows.
   $(q_{hourly}) = (Q_{yearly})/(Y$ hrs/yr)

5. The annual average concentration (or ground level concentration GLC) can be estimated as follows.
   $GLC = (c_{annual})\ (q_{hourly})$
   $= (c_{1\text{-}hr})$(Scalar) (Yhrs/8760hrs) $(Q_{yearly})/(Y$ hrs/yr)
   $= (c_{1\text{-}hr})$(Scalar) $(Q_{yearly})/(8760$ hrs/yr)

Practically speaking, the above five steps condense down to determining three values. The first value is the maximum 1-hour concentration. The second value is the Scalar (either 1.0, 0.8, or 0.5). And the third value is the hourly emission rate estimated by uniformly distributed over the entire year (8760 hours). The operating hours per year drops out of the calculations for an annual average concentration provided the emissions are based on an annual inventory (See step 5).

In the event that the acute averaging period is required and the emissions are based on an annual inventory, then the annual operating hours are required.

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

Below are four examples using the steps as outlined above. In each case, the annual average concentration is the desired value for use in risk assessment calculations. A fifth example is also included to demonstrate the need for the operating hours per year for an acute analysis when the inventory is provided on an annual basis.

Example 1 - Fugitive Gasoline Station Emissions

Emissions are **continuous** for 24 hours per day and 365 days per year.

1. Estimate the maximum 1-hour concentration with the Screen3 model (or similar screening modeling approach), $c_{1\text{-}hr}$.

2. Estimate the annual average concentration, $c_{annual,}$ with the U.S. EPA screening factor of 0.08.
   $(c_{annual}) = (c_{1\text{-}hr})(0.08)$

3. The hourly emission rate, $q_{hourly}$, for the annual average concentration is based on 24 hours per day and 365 days per year (8760 hours per year).
   $(q_{hourly}) = (Q_{yearly})/(8760\ hrs/yr)$

4. The annual average concentration (or ground level concentration GLC) can be estimated as follows.
   $GLC = (c_{annual})\ (q_{hourly})$
   $GLC = (c_{1\text{-}hr})(0.08)\ (Q_{yearly})/(8760\ hrs/yr)$

Example 2 - Dry Cleaner Emissions

Emissions are **intermittent** over the year but **systematic** for 10 hours per day, 5 days per week and 50 weeks per year.

1. Estimate the maximum 1-hour concentration with the Screen3 model (or similar screening modeling approach), $c_{1\text{-}hr}$.

2. Estimate the maximum 8-hour average concentration, $c_{8\text{-}hr,}$ with the U.S. EPA screening factor of $0.7 \pm 0.2$ as the longest averaging period of continuous release. The averaging period would need to be less than 10 hours. Use the lower range of the screening factor, 0.5, because the annual average is the final product and variability due to seasonal differences are not accounted for otherwise.
   $(c_{8\text{-}hr}) = (c_{1\text{-}hr})(0.5)$

3. Assume the worst-case 8-hour concentration is persistent throughout the year and pro-rate the concentration based on emissions over the year. For this dry cleaner, there are 2500 hours of operating condition emissions. Therefore the annual average is calculated as follows.
   $(c_{annual}) = (c_{8\text{-}hr})\ (2500hrs/8760hrs)$
   $= (c_{1\text{-}hr})(0.5)\ (2500hrs/8760hrs)$

4. The hourly emission rate, $q_{hourly}$, for the annual average concentration is based on 2500 hours per year.
   $(q_{hourly}) = (Q_{yearly})/(2500\ hrs/yr)$

5. The annual average concentration (or ground level concentration GLC) can be estimated as follows.
   $GLC = (c_{annual})\ (q_{hourly})$
   $= (c_{1\text{-}hr})(0.5)\ (2500hrs/8760hrs)\ (Q_{yearly})/(2500\ hrs/yr)$
   $= (c_{1\text{-}hr})(0.5)\ (Q_{yearly})/(8760\ hrs/yr)$

Example 3 - Burning Barrel Emissions

Emissions are **intermittent** over the year and **random** during daylight hours for two hours per burn, two burns per week, and 52 weeks per year.

1. Estimate the maximum 1-hour concentration with the Screen3 model (or similar screening modeling approach), $c_{1\text{-}hr}$. Meteorological combinations may be restricted to daytime conditions for this screening analysis. Pasquill-Gifford stability classes A, B, C, and D are unstable and neutral conditions for daytime conditions.

2. Estimate the maximum 8-hour average concentration, $c_{8\text{-}hr,}$ with the U.S. EPA screening factor of $0.7 \pm 0.2$ as the longest averaging period where the emissions have the potential to be randomly distributed. Depending on the day of the year and latitude of the emissions, the daylight hours can vary. For this example, we assume the daylight hours can be as short as 10 hours per day to as long as 14 hours per day. Since the emissions are randomly distributed throughout the daylight hours, the longest averaging period we can scale with U.S. EPA scaling factors is a 10 hour average. In this case, the averaging period becomes the 8-hour average and the scaling factor becomes $0.7 \pm 0.2$. Again since this is for an annual average, we use the lower end of the range, 0.5.
   $(c_{8\text{-}hr}) = (c_{1\text{-}hr})(0.5)$

3. Assume the worst-case 8-hour concentration is persistent throughout the year and pro-rate the concentration based on the emissions over the year. For the burning barrels there are 208 hours of operating condition emissions (208 hrs = (2hrs/burn)(2burns/wk)(52wk/yr)). Therefore the annual average concentration is calculated as follows.
   $(c_{annual}) = (c_{8\text{-}hr})\ (208hrs/8760hrs)$
   $= (c_{1\text{-}hr})(0.5)\ (208hrs/8760hrs)$

4. The hourly emission rate, $q_{hourly}$, for the annual average concentration is based on 208 hours per year.
   $(q_{hourly}) = (Q_{yearly})/(208\ hrs/yr)$

5. The annual average concentration (or ground level concentration GLC) can be estimated as follows.

$GLC = (c_{annual})\ (q_{hourly})$
$= (c_{1\text{-}hr})(0.5)\ (208hrs/8760hrs)\ (Q_{yearly})/(208\ hrs/yr)$
$= (c_{1\text{-}hr})(0.5)\ (Q_{yearly})/(8760\ hrs/yr)$

Example 4 - Standby Diesel Engine Testing

Emissions are **intermittent** over the year and **systematic** for two hours per week and 50 weeks per year. The engine testing is conducted at 2 pm on Fridays.

1. Estimate the maximum 1-hour concentration with the Screen3 model (or similar screening modeling approach), $c_{1\text{-}hr}$. Meteorological combinations may be restricted to daytime conditions in this screening analysis because the engine test is conducted at 2 pm. Pasquill-Gifford stability classes A, B, C, and D are unstable and neutral conditions for daytime conditions.

2. In this case, the emission schedule is systematically fixed over a two hour period. Therefore, the longest averaging period which is applicable for the U.S. EPA screening factors is one-hour because a two-hour conversion factor is not available. Therefore, we assume the maximum 1-hour concentration is persistent for the entire year. We still prorate the concentration based on the emissions. There are 100 hours of engine testing per year. Therefore the annual average concentration becomes.
$(c_{annual}) = (c_{1\text{-}hr})\ (100hrs/8760hrs)$

3. The hourly emission rate, $q_{hourly}$, for the annual average concentration is based on 100 hours per year.
$(q_{hourly}) = (Q_{yearly})/(100\ hrs/yr)$

4. The annual average concentration (or ground level concentration GLC) can be estimated as follows.
$GLC = (c_{annual})\ (q_{hourly})$
$= (c_{1\text{-}hr})\ (100hrs/8760hrs)\ (Q_{yearly})/(100\ hrs/yr)$
$= (c_{1\text{-}hr})\ (Q_{yearly})/(8760\ hrs/yr)$

Below is an example using the steps above to estimate an acute concentration longer than a 1-hour averaging period. This case is similar to Example 3 above with the exception of the averaging period.

Example 5 - Burning Barrel Emissions – Acute REL

Emissions are **intermittent** over the year and **random** during daylight hours for two **continuous** hours per burn, two burns per week, and 52 weeks per year. The arsenic acute REL is for a 4-hour averaging period. The steps below are used to estimate the acute concentration, 4-hour REL, for arsenic.

1. Estimate the maximum 1-hour concentration with the Screen3 model (or similar screening modeling approach), $c_{1\text{-}hr}$. Meteorological combinations may be restricted

to daytime conditions for this screening analysis. Pasquill-Gifford stability classes A, B, C, and D are unstable and neutral conditions for daytime conditions.

2. The maximum 1-hour concentration is used as is without screening adjustment factors listed in Tables H.1 or H.2. The emissions are **continuous** through a 2-hour event within a 4-hour window. The adjustments in Table H.2 would only be used if the emissions were continuous for a 4-hour event or **randomly** distributed through a 4-hour event.

3. Assume the worst-case 1-hour concentration is persistent for the 4-hour averaging period and pro-rate the concentration based on the emissions over the 4-hour window. For the burning barrels there are 2 hours of operating condition emissions (2hrs/burn). Therefore the 4-hour average concentration is calculated as follows.
   $(c_{4\text{-hr}}) = (c_{1\text{-hr}})$ (2hrs/4hrs)

4. The hourly emission rate, $q_{hourly}$, for the annual average concentration is based on 208 hours per year (208 hrs = (2hrs/burn)(2burns/wk)(52wk/yr)).
   $(q_{hourly}) = (Q_{yearly})/(208$ hrs/yr)

5. The 4-hr average concentration (or ground level concentration $GLC_{4\text{-hr}}$) can be estimated as follows.
   $GLC_{4\text{-hr}} = (c_{4\text{-hr}})\ (q_{hourly})$
   $= (c_{1\text{-hr}})$ (2hrs/4hrs) $(Q_{yearly})/(208$ hrs/yr)

   This step of Example 5 differs from the previous Examples because the number of operating hours per year does not drop out of the calculation as seen above.

The above methods were used in a recent modeling evaluation for emissions from a burning barrel (example 3 above) (ARB, 2002). Table H.3, below, shows results from the modeling evaluation. Shown in Table H.3 are the maximum annual average concentration based on the screening approach outlined above as well as a refined approach with site specific meteorological data from four locations, Alturas, Bishop, San Benito, and Escondido. As seen in Table H.3, the screening evaluation as described in the example overestimates the values calculated based on the refined analysis. This is the desired outcome of a screening approach.

**Table H.3**
**Maximum Annual Average Concentration (c/q)**
**Above Ambient Conditions - Burning Barrel Emissions**

| Met. City | Alturas | Bishop | San Benito | Escondido | *SCREENING* |
|---|---|---|---|---|---|
| D (m) | (mg/m$^3$)/(g/s) | (mg/m$^3$)/(g/s) | (mg/m$^3$)/(g/s) | (mg/m$^3$)/(g/s) | *(mg/m$^3$)/(g/s)* |
| 20 | 44. | 61. | 85. | 110. | *590.* |
| 50 | 12. | 16. | 22. | 30. | *230.* |
| 100 | 4. | 5. | 7. | 9. | *85.* |

Notes: (a) Annual $\chi$/q is based on 208 hours of emissions at 1 g/s.
(b) $\chi$/q is the concentration in $\mu g/m^3$ based on an hourly emission rate of 1 g/s.

## G. Implementation

The approach outlined above has been implemented in the HARP program. Appendix J provides example output files from the Hot Spot Analysis and Reporting Program (HARP). The HARP software has been developed by a contractor through consultation with OEHHA, Air Resources Board (ARB), and District representatives. The HARP software is the recommended model for calculating and presenting HRA results for the Hot Spots Program. Information on obtaining the HARP software can be found on the ARB's web site at www.arb.ca.gov. Note, since the HARP software is a tool that uses the methods specified in this document, the software will be available after these guidelines have undergone public and peer review, been endorsed by the state's Scientific Review Panel (SRP) on Toxic Air Contaminants, and adopted by OEHHA.

**References**

ARB (1994). ARB memorandum dated 4/11/94 from A. Ranzieri to J. Brooks on the subject, "One-hour to Thirty-day Average Screening Factor."

ARB (2002). Staff Report: Initial Statement of Reasons for the Proposed Airborne Toxic Control Measure to Reduce Emissions of Toxic Air Contaminants from Outdoor Residential Waste Burning, January 2002. California Air Resources Board.

U.S. EPA (1992). Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised, October 1992, EPA-454/R-92-019. U.S. Environmental Protection Agency, Research Triangle Park, NC.

# Appendix I

# Calculation Examples for

# Estimating Potential Health Impacts

# Appendix I

# Calculation Examples for Estimating Potential Health Impacts

This appendix provides three example calculations to illustrate the procedures to estimate potential health impacts from a facility. The examples provided are intended to assist the risk assessor in understanding the steps associated with conducting the final step of risk assessment, risk characterization. The three examples provided in this appendix evaluate the inhalation cancer risk, the noncancer acute hazard quotient (HQ) and hazard index (HI), and the multipathway (inhalation and oral) noncancer chronic HQ and HI for seven compounds. Specific requirements for health risk assessment (HRA) under the Hot Spots Program are presented in Chapter 8. The HARP software will perform the calculations that are presented here and required in Chapters 8 and 9. See the ARB's website at *www.arb.ca.gov* for more information on HARP.

## A. Sample Calculation for Inhalation Cancer Health Risk Assessment

The following example illustrates the steps for calculating cancer risk at the maximum exposed individual resident (MEIR) using the high-end point-estimate for the inhalation exposure pathway. This example does not cover the steps for completing a noninhalation or multipathway HRA. Algorithms to estimate point-estimate and stochastic multipathway exposure can be found in Chapter 5. For simplicity, it is recommended that the risk assessor use HARP to conduct a multipathway risk assessment or stochastic risk assessment.

***Step one - Determine the annual average concentration at the MEIR and inhalation cancer potency factor for each emitted compound.***

The risk assessor would obtain the annual average concentrations from the air dispersion modeling results. This step has been completed for this example. Table I.1 presents the annual average concentrations at our hypothetical facility. In addition, Table I.1 also presents inhalation cancer potency factors for each substance, which also can be found in Chapter 7 and Appendix L. Note that where no inhalation cancer potency has been developed for a substance, the tables in this example have been annotated with dashes, since it will not be possible to conduct a quantitative risk assessment for these compounds. As previously stated, this example does not take into account multipathway effects for the compounds listed in Table I.1. It is recommended that the risk assessor use HARP for conducting such an analysis.

**Table I.1 Annual Average Concentrations at the MEIR and Inhalation Cancer Potency Factors**

| Substance | Annual Average Concentrations ($\mu g/m^3$) | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ |
|---|---|---|
| Ammonia | -- | -- |
| Arsenic | 0.0015 | 12 |
| Benzene | 5 | 0.10 |
| Chlorine | -- | -- |
| Chlorobenzene | -- | -- |
| 2,3,7,8-TCDD (dioxin) | 0.000004 | 130,000 |
| Nickel | 0.02 | 0.91 |

***Step two - Determine the inhalation dose for each compound.***

Once you have determined the annual average concentration for the emitted substance, the equation below is used to calculate the inhalation dose for each substance. This equation is listed in Section 5.4.1 of this document, and is also listed in the *Air Toxics Hot Spots Risk Assessment Guidelines*; *Part IV; Exposure Assessment and Stochastic Analysis Technical Support Document (OEHHA, 2000b)* (Part IV TSD).

$$\text{dose} - \text{inh} = \frac{(\text{Cair})(\text{DBR})(\text{A})(\text{EF})(\text{ED})(1\times 10^{-6})}{\text{AT}}$$

Where:

| | | |
|---|---|---|
| dose-inh | = | Dose through inhalation (mg/kg/d) |
| $1x10^{-6}$ | = | Micrograms to milligrams conversion ($10^{-3}$ mg/µg), liters to cubic meters conversion ($10^{-3}$ $m^3$/l) |
| Cair | = | Concentration in air ($\mu g/m^3$) |
| DBR | = | Daily breathing rate (L/kg body weight-day or L/kg-day) |
| A | = | Inhalation absorption factor |
| EF | = | Exposure frequency (days/year) |
| ED | = | Exposure duration (years) |
| AT | = | Averaging time period over which exposure is averaged, in days (e.g., 25,550 days for 70 year cancer risk) |

A summary of the exposure point-estimates and data distributions for use in risk assessment can be found in Chapter 5 of this document. For more detail on point-estimates and data distributions see the Part IV TSD. The recommended default values presented in Table I.2 can be used when site-specific information is not available.

**Table I.2 Recommended Default Values**

| Variable | Recommended Default Value |
|---|---|
| EF | 350 days/year |
| ED | 9; 30; or 70 years |
| AT | 70 years (25,550 days) |
| DBR (used in this example) 30 and 70 year-exposure | 271 (mean); 393 (95$^{th}$ percentile) L/kg body weight – day (For other DBRs see Table 5.4, Chapter 5) |
| A | 1 (currently used for all substances included in the Hot Spots program) |

The following equation shows the calculation for the inhalation dose of arsenic by using the annual average concentration for arsenic (Table I.1) and the recommended default values in Table I.2. Note that the high-end (95$^{th}$ percentile) 70-year daily breathing rate of 393 liters/kg - day was used in this example.

$$\text{arsenic}\ (\text{dose}-\text{inh}) = \frac{\left(\frac{0.0015\,mg}{m^3}\right)\left(\frac{393\,liters}{kg-day}\right)(1)\left(\frac{350\ days}{year}\right)(70\ years)\left(\frac{1\text{x}10^{-3}\ mg}{1mg}\right)\left(\frac{1\text{x}10^{-3}\ m^3}{liters}\right)}{25{,}550\ days}$$

$$\text{arsenic}\ (\text{dose}-\text{inh}) = 5.7\times10^{-7}\,mg/kg-day$$

This calculation would be repeated for each substance under evaluation using their respective annual average concentrations. For our hypothetical facility, we have calculated each inhalation dose for each substance. Table I.3 shows the results from our analysis.

**Table I.3 Calculated Doses for Substances**

| Compound | Calculated Dose |
|---|---|
| Ammonia | -- |
| Arsenic | 5.7 x 10$^{-7}$ |
| Benzene | 1.9 x 10$^{-3}$ |
| Chlorine | -- |
| Chlorobenzene | -- |
| 2,3,7,8-TCDD (dioxin) | 1.5 x 10$^{-9}$ |
| Nickel | 7.5 x 10$^{-6}$ |

***Step three – Determine potential inhalation cancer risk for the MEIR.***

Once you have calculated the inhalation dose, multiply the dose by the inhalation cancer potency factor as shown below. Use a factor of $1x10^6$ to express cancer risk in chances per million.

$$\left(\text{Inhalation Dose } \frac{mg}{kg-day}\right)\left(\text{Cancer Potency } \frac{kg-day}{mg}\right)\left(1 \times 10^6\right) = \text{Cancer Risk (chances per million)}$$

For our hypothetical facility, the equation below shows the calculation for the inhalation cancer risk of arsenic. For this example, the inhalation cancer potency factor for arsenic is 12 $(mg/kg\text{-}d)^{-1}$ taken from Table I.1.

$$\left(5.7 \times 10^{-7} \frac{mg}{kg-day}\right)\left(12 \frac{kg-day}{mg}\right)\left(1 \times 10^6\right) = 6.8 \text{ chances per million}$$

Use the substance-specific inhalation dose and inhalation cancer potency factor to determine the cancer risk for each compound by repeating this step. Finally, sum the individual substance cancer risks to give you the total facility (inhalation) cancer risk. Table I.4 shows the individual substance and total facility potential (inhalation) cancer risk. In this example, our hypothetical facility poses a (inhalation) cancer risk of 399 chances per million at the MEIR. Note, although not presented here, a facility emitting arsenic or dioxins should also evaluate cancer risk from noninhalation exposure pathways.

**Table I.4 Hypothetical Facility Inhalation Cancer Risk**

| Compound | Cancer risk (per million) |
|---|---|
| Ammonia | -- |
| Arsenic | 6.8 |
| Benzene | 190 |
| Chlorine | -- |
| Chlorobenzene | -- |
| 2,3,7,8-TCDD (dioxin) | 195 |
| Nickel | 6.8 |
| **Total Facility Inhalation Cancer Risk** | **399** |

While this example illustrates the steps used to calculate cancer risk using the inhalation dose algorithm, steps one through three can also be used to calculate noninhalation cancer risk and ultimately multipathway (inhalation and noninhalation pathway) cancer risk. To determine noninhalation cancer risk, an assessor should use the appropriate exposure pathway algorithm presented in Chapter 5. For example, equation 5.4.3.1.A (Chapter 5) would be used to determine

dose for the soil ingestion pathway. Once the assessor has determined the ingestion dose, the cancer risk for that pathway is calculated using the substance-specific oral slope factor. Oral slope factors can be found in Appendix L and Chapter 7. To calculate multipathway cancer risk, the cancer risks for all substances and exposure pathways are summed. See Chapter 8 for further discussion.

## B. Sample Calculation of Noncancer Acute Hazard Indices

Risk characterization for noncancer health impacts are expressed as a hazard quotient (for individual substances) or a hazard index (for multiple substances). In addition, all hazard quotients (HQ) and hazard indices (HI) must be determined by target organ system. The example below illustrates the approach for calculating a noncancer acute HQ and HI at the MEIR. As discussed in Chapter 8, the following example is provided to assist the risk assessor in understanding how to calculate an acute HQ and HI. Using HARP, both the acute HQ and HI will be automatically calculated at each receptor. No exposure duration adjustment should be made for noncancer assessments. Specific requirements for risk assessment under the Hot Spots Program can be found in Chapters 8 and 9.

***Step one - Determine the 1-hour maximum concentrations at the MEIR and acute reference exposure levels (RELs) for each emitted substance.***

The risk assessor would obtain the 1-hour maximum (or 4, 6, or 7-hour, if required) concentrations from the air dispersion modeling results. This step has been completed for this example. Table I.5 presents the maximum 1, 4, 6, or 7-hour concentrations, target organ systems, and acute RELs for seven substances. Note that where an acute REL has not been developed for a substance, the tables in this example have been annotated with dashes. In this

**Table I.5 Concentrations, Acute RELs, and Target Organ System(s) for Substances at the MEIR**

| Substance | 1, 4, 6 or 7-hour Maximum Concentration ($\mu g/m^3$) | Acute REL ($\mu g/m^3$) | Target Organ System(s) |
|---|---|---|---|
| Ammonia | 1900 | 3200 | Respiratory system; Eye |
| Arsenic | 0.03 | 0.19 | Reproductive/developmental |
| Benzene | 20 | 1300 | Reproductive/developmental; Immune system; Hematologic system |
| Chlorine | 40 | 210 | Respiratory system; Eye |
| Chlorobenzene | -- | -- | -- |
| 2,3,7,8-TCDD (dioxin) | -- | -- | -- |
| Nickel | 1.8 | 6 | Respiratory system; Immune system |

example, chlorobenzene and 2,3,7,8-TCDD (dioxin) do not have acute REL values. The acute RELs and their corresponding target organ system(s) can be found in Table 6.1 (Chapter 6) and also in Appendix L.

***Step two - Determine the hazard quotient for each compound.***

The hazard quotients for each compound are calculated by taking the acute maximum 1, 4, 6, or 7-hour concentration and dividing by the substance-specific acute REL. The following equation shows how to calculate the hazard quotient for ammonia.

$$\text{Acute Hazard Quotient} = \frac{\left(\begin{matrix}Maximum\ 1,\ 4,\ 6,\ or\ 7-hr\\ Concentration\end{matrix}\right)}{\left(\begin{matrix}Acute\\ REL\end{matrix}\right)} \Rightarrow \text{Acute Hazard Quotient}_{(\text{ammonia})} = \frac{\left(1900\ mg/m^3\right)}{\left(3200\ mg/m^3\right)} = 0.6$$

***Step three – Determine the HI for all emitted substances.***

The acute HI is calculated by summing each hazard quotient for each substance by target organ system(s). For example, add the HQs for all substances that impact the respiratory system, then repeat this step for the next target organ system (e.g., reproductive/developmental system). This step is repeated until all target organs (for the substances emitted) are individually totaled. See Table 6.1 for target organ system information. Note, never add together the HQs or HIs for different target organ systems (e.g., do not add the impacts for the respiratory system to the reproductive/developmental system). Table I.6 shows individual hazard quotients for each substance and total hazard index. {Bob, adding benzene (6-hr) and arsenic (4-hr) below OK?]

**Table I.6 Individual Hazard Quotients and Total Hazard Index**

| Substance | Immune System | Reproductive/ Developmental | Hematologic System | Respiratory System | Eye |
|---|---|---|---|---|---|
| Ammonia | | | | 0.6 | 0.6 |
| Arsenic | | 0.2 | | | |
| Benzene | 0.02 | 0.02 | 0.02 | | |
| Chlorine | | | | 0.2 | 0.2 |
| Chlorobenzene | | | | | |
| 2,3,7,8-TCDD (dioxin) | | | | | |
| Nickel | 0.3 | | | 0.3 | |
| **Total Hazard Index** | **0.32** | **0.22** | **0.02** | **1.1** | **0.8** |

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In this example, an HQ of one was not equaled or exceeded for any individual substance. However, an HI (the sum of the hazard quotients for each target organ) of one was exceeded for the respiratory system. Exceeding a hazard index of one may indicate that there is the potential for adverse acute health impacts at this receptor location. Therefore, there is increased concern that exposed individuals may experience respiratory system irritation, particularly among sensitive individuals. The District and OEHHA should be consulted when a hazard index exceeds one (see Section 8.3).

## C. Sample Calculation of Noncancer Chronic Hazard Indices

The example below illustrates the approach for calculating a noncancer chronic HQ and HI at the MEIR. An HQ expresses the noncancer health impacts for an individual substance and an HI expresses the potential impacts for multiple substances. As discussed in Chapter 8, the following example is provided to assist the risk assessor in understanding the calculation of a chronic HQ and HI. Using the HARP software, both the chronic HQ and HI will be automatically calculated at each receptor. No exposure duration adjustment (e.g., 9/70) should be made for noncancer assessments. Specific requirements for risk assessment under the Hot Spots Program can be found in Chapters 8 and 9.

***Step one - Determine the annual average concentrations at the MEIR and inhalation and oral chronic RELs for each emitted substance.***

The risk assessor would obtain the substance-specific annual average concentrations from the air dispersion modeling results. This step has been completed for this example. Table I.7 presents the annual average concentrations, target organ systems, and chronic RELs for seven substances. All of the substances have a chronic REL value associated with them. In addition, arsenic, dioxins, and nickel are multipathway substances; therefore, oral and dermal exposure must be included as potential exposure pathways. The chronic RELs and their corresponding target organ system(s) can be found in Tables 6.2 and 6.3 (Chapter 6) and also in Appendix L.

**Table I.7 Annual Average Concentrations, Chronic RELs, and Target Organ Systems for Substances at the MEIR.**

| Substance | Annual Average Conc. ($\mu g/m^3$) | Chronic REI (inhalation) ($\mu g/m^3$) | Target Organ System(s) (inhalation) | Chronic Oral REL (mg/kg-day) | Target Organ System(s) (oral/dermal) |
|---|---|---|---|---|---|
| Ammonia | 160 | 200 | Respiratory System | - | - |
| Arsenic | 0.0015 | 0.03 | Development; Cardiovascular System; Nervous System | 0.0003 | Cardiovascular system; skin |
| Benzene | 5 | 60 | Hematopoietic System; Development; Nervous System | - | - |
| Chlorine | 0.08 | 0.2 | Respiratory System | - | - |
| Chlorobenzene | 20 | 1000 | Alimentary System; Kidney; Reproductive System | - | - |
| 2,3,7,8-TCDD (dioxin) | 0.000004 | 0.00004 | Alimentary System (Liver); Reproductive System; Development; Endocrine System; Respiratory System; Hematopoietic System | 0.00000001 (10 pg/kg-day) | Alimentary System (Liver); Reproductive System; Development; Endocrine System; Respiratory System; Hematopoietic System |
| Nickel | 0.02 | 0.05 | Respiratory System; Hematopoietic System | 0.05 | Alimentary System |

***Step two – Determine the inhalation chronic hazard quotient for each substance.***

For inhalation exposure, the individual hazard quotients for each substance are calculated by taking the annual average concentration and dividing by its corresponding chronic inhalation REL. Using the information contained in Table I.7, the equation below is used to calculate the inhalation hazard quotient for arsenic.

$$\text{Chronic Hazard Quotient} = \frac{\left(\begin{matrix}\text{Annual avg.}\\ \text{Concentration}\end{matrix}\right)}{\left(\begin{matrix}\text{Chronic}\\ \text{REL}\end{matrix}\right)} \Rightarrow \text{Chronic Hazard Quotient}_{(arsenic)} = \frac{\left(0.0015\ \mu g/m^3\right)}{\left(0.03\ \mu g/m^3\right)} = 0.05$$

***Step three – Determine the noninhalation hazard quotient for each substance.***

For the substances that are subject to deposition, noninhalation (i.e., oral and dermal) exposure pathways need to be considered in the chronic hazard quotient evaluation. The point-estimates and algorithms for calculating the oral dose for all of the applicable exposure

pathways and receptors (e.g., workers or residents) are explained in Chapter 5. Note, the HARP software uses the appropriate information and performs all the steps discussed in these examples.

As discussed in Sections 8.2.5 and 8.3, Tier-1 of the tiered approach to risk assessment states that the high-end point-estimates are used for the two dominant noninhalation exposure pathways and the non-dominant exposure pathways use the average point-estimates to determine the dose and chronic health impacts at a residential receptor. To determine which exposure pathways are the two dominant ones, high-end point-estimates are used for all applicable exposure pathways to see which two pathways provide the highest impacts for each substance. Once the two dominant noninhalation pathways are determined for each substance, the doses for the remaining noninhalation exposure pathway for that substance are recalculated using the average point-estimates. The 70-year exposure duration point-estimates are used for residential receptors and the worker (single) point-estimates are used for the maximum exposed worker (see Chapter 5). No exposure duration adjustment (e.g., 9/70) should be made for noncancer assessments.

This example shows how to combine the impacts from multiple exposure pathways to obtain an oral (noninhalation) hazard quotient for a single substance. For each substance, the impacts for a specific exposure pathway are assessed by dividing the oral dose (derived from the annual average concentration) in milligrams per kilogram-day (mg/kg-day) by the oral chronic REL, expressed in units of (mg/kg-day) (Table 6.3). The next equation shows the HQ calculation for arsenic through the soil ingestion (SI) exposure pathway.

Note, prior to this point in this calculation, we are assuming several steps have taken place. These steps include: 1) the completion of air dispersion modeling to obtain the ground-level annual-average air concentration; 2) identification of the existing exposure pathways at the receptor location; 3) calculation of the concentration in the exposure media (e.g., for soil - Equation 5.3.2.A); 4) determination of the dominant noninhalation exposure pathway(s) for the substance; and 5) the calculation of the substance-specific dose for that exposure pathway (e.g., Equation 5.4.3.1.A is used to calculate the dose from soil ingestion). See Chapter 5 for the algorithms for calculating the oral dose for all of the applicable exposure pathways and receptors. For this example, the calculated dose for arsenic from soil ingestion is assumed to be 0.000015 mg/kg-day.

$$\text{Chronic Oral Hazard Quotient} = \frac{SI\ dose}{\left(\frac{Chronic}{Oral\ REL}\right)} \Rightarrow \text{Chronic Oral Hazard Quotient}_{(SI\ arsenic)} = \frac{(0.000015\ mg/kg-day)}{(0.0003\ mg/kg-day)} = 0.05$$

For each substance, this step is repeated for each applicable noninhalation exposure pathway. As illustrated below, the (total) oral HQ for a substance is calculated by summing the HQs for all applicable exposure pathways. In this example, the chronic oral HQ is assumed to equal 0.1.

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$$\text{Chronic Oral Hazard Quotient*}_{(\text{arsenic})} = [HQ_{(SI)} + HQ_{(D)} + HQ_{(DW)} + HQ_{(MI)} + HQ_{(FI)} + HQ_{(HV)}]$$

$$\text{Chronic Oral Hazard Quotient*}_{(\text{arsenic})} = 0.1$$

* Noninhalation pathways:

| | |
|---|---|
| SI = soil ingestion | FI = fisher-caught fish |
| DW = drinking water | HV= homegrown vegetables |
| D = dermal absorption | BM= breast milk (not applicable for arsenic exposure) |
| MI = meat, milk & egg | |

***Step four – Determine the chronic HI***

The chronic HI is calculated by summing each hazard quotient (inhalation and noninhalation) for each substance by the target organ system(s). For example, add the HQs for all substances that impact the respiratory system, then repeat this step for the next target organ

**Table I.8 Substance-Specific Inhalation and Noninhalation Hazard Quotients and the Hazard Index by Target Organ System**

| Substance | Respiratory System | Hematopoietic System | Alimentary System | Endocrine System | Development | Reproductive System | Kidney | Nervous System | Cardiovascular System | Skin |
|---|---|---|---|---|---|---|---|---|---|---|
| Ammonia | 0.8 | | | | | | | | | |
| ***Arsenic*** | | | | | ***0.05(i)*** | | | ***0.05(i)*** | ***0.05(i)*** ***0.1(ni)*** | ***0.1(ni)*** |
| Benzene | | 0.08 | | | 0.08 | | | 0.08 | | |
| Chlorine | 0.04 | | | | | | | | | |
| Chlorobenzene | | | 0.02 | | | 0.02 | 0.02 | | | |
| 2,3,7,8-TCDD (dioxin) | 0.1(i) 0.2(ni) | 0.1(i) 0.2(ni) | 0.1(i) 0.2(ni) | 0.1(i) 0.2(ni) | 0.1(i) 0.2(ni) | 0.1(i) 0.2(ni) | | | | |
| Nickel | 0.4(i) | 0.4(i) | 0.1(ni) | | | | | | | |
| **Hazard Index** | **1.54** | **0.78** | **0.32** | **0.3** | **0.43** | **0.32** | **0.02** | **0.13** | **0.15** | **0.1** |

i = inhalation pathway contribution
ni = noninhalation pathway contribution

system (e.g., cardiovascular system). This step is repeated until all target organs (for the substances emitted) are individually totaled. See Tables 6.2 and 6.3 for target organ system information. Note, never add together the HQs or HIs for different target organ systems (e.g., do not add the impacts for the respiratory system to the cardiovascular system). No exposure duration adjustment (e.g., 9/70) should be made for noncancer assessments. Table I.8 shows individual hazard quotients (inhalation and noninhalation) for each substance and the hazard index by target organ system. In this table, arsenic is highlighted in bold to identify how the information calculated above is presented and used.

In this example, an HQ of one was not equaled or exceeded for any individual substance. However, an HI (the sum of the hazard quotients for each target organ) of one was exceeded for the respiratory system. Exceeding a hazard index of one may indicate that there is the potential for adverse chronic health impacts at this receptor location. Therefore, there is increased concern that exposed individuals may experience respiratory system irritation or injury, particularly among sensitive individuals. The District and OEHHA should be consulted when a hazard index exceeds one (see Section 8.3).

# Appendix J

# Glossary Of Acronyms and Definition of Selected Terms

# Glossary of Acronyms and Definitions of Selected Terms

**Acute Exposure:** One or a series of short-term exposures generally lasting less than 24 hours.

**Acute Health Effects:** A health effect that occurs over a relatively short period of time (e.g., minutes or hours). The term is used to describe brief exposures and effects which appear promptly after exposure.

**Adverse Health Effect:** A health effect from exposure to air contaminants that may range from relatively mild temporary conditions, such as eye or throat irritation, shortness of breath, or headaches, to permanent and serious conditions, such as birth defects, cancer or damage to lungs, nerves, liver, heart, or other organs.

**AERMOD:** a proposed (by U.S. EPA) steady-state, plume-based air dispersion model for estimating near-field impacts from a variety of industrial source types (designed to provide reasonable concentration estimates over a wide range of conditions with minimal discontinuities, to be easily implemented with reasonable input requirements and computer resource needs, to be based on up-to-date science that captures the essential physical processes while remaining simple, and to be easily revised as the science evolves). To the extent practicable, the structure of the input or the control file for AERMOD is the same as that for ISCST3.

**Air Dispersion Modeling:** Algorithms, usually performed with a computer, that relate a mass emission rate, source configuration, and meteorological information to calculate ambient air concentrations.

**Air District:** The Air Pollution Control and Air Quality Management Districts are the political bodies responsible for managing air quality on a regional or county basis. California is currently divided into 35 air districts.

**Air monitoring:** The periodic or continuous sampling and analysis of air pollutants in ambient air or from individual pollutant sources.

**Air Toxics Hot Spots Act Emission Inventory Reports:** Documents that contain information regarding emission sources, emitted substances, emission rates and release parameters, prepared under the Emission Inventory Criteria and Guidelines (also referred to as "Inventory Reports").

**Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588):** (Health and Safety Code, Section 44300-44394) - A state law which established the "Hot Spots" Program to develop a statewide inventory of site-specific air toxic emissions, to assess the risk to public health from exposure to these emissions, to notify the public of any significant health risks and to reduce emissions below the significant risk levels.

**Algorithm:** a set of rules for solving a problem in a finite number of steps

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**California Air Resources Board (ARB):** The State's lead air quality management agency consisting of an eleven-member board appointed by the Governor. The ARB is responsible for attainment and maintenance of the state and federal air quality standards, and is fully responsible for motor vehicle pollution control. It oversees county and regional air pollution management programs.

**Asthma:** A chronic inflammatory disorder of the lungs characterized by wheezing, breathlessness, chest tightness, and cough.

**Atmospheric half-life:** The time required for the concentration of a pollutant or reactant to fall to one-half of its initial value.

**Benchmark Dose:** That dose derived from linear regression of one or more dose-response curves associated with a specific response rate (such as 1, 5, or 10%) in the test population. This is the starting dose to which uncertainty factors are applied to determine a reference exposure level (REL) using the benchmark dose approach.

**Urban Block Groups (BGs):** A geographical unit smaller than a census tract used for reporting census data. BGs contain roughly 1,100 persons.

**Bioaccumulation:** the concentration of a substance in a body or part of a body or other living tissue in a concentration higher than that of the surrounding environment

**Bioconcentrate:** The process of increasing contaminant concentration in biota up the food chain as contaminants are ingested and concentrated in tissues of organisms higher up in the chain.

**Cancer burden:** The estimated number of theoretical cancer cases in a defined population resulting from lifetime exposure to pollutants emitted from a facility.

**Cancer potency factor (CPF):** The theoretical upper bound probability of extra cancer cases occurring in an exposed population assuming a lifetime exposure to the chemical when the chemical dose is expressed in exposure units of milligrams/kilogram-day (mg/kg-d).

**California Air Pollution Control Officers Association (CAPCOA):** A non-profit association of the air pollution control officers from all 35 air quality districts throughout California. CAPCOA was formed in 1975 to promote clean air and to provide a forum for sharing knowledge, experience, and information among the air quality regulatory agencies around the state.

**Cal/EPA:** In July 1991, the California Environmental Protection Agency (Cal/EPA) was created to coordinate the State's environmental quality programs and assure that there is a cabinet level voice for environmental protection.

**Chemical Abstract Services Registry Number (CAS):** The Chemical Abstracts Service Registry Number (CAS) is a numeric designation assigned by the American Chemical Society's Chemical Abstracts Service and uniquely identifies a specific chemical compound. This entry allows one to conclusively identify a material regardless of the name or naming system used.

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**CCR:** California Code of Regulations

**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act (Superfund), a federal regulation providing direction and financial support for the clean-up of major hazardous waste sites

**Centroid Locations:** The location at which calculated ambient concentration is assumed to represent the entire subarea, typically the geometric centroid of an area, but possibly the population-weighted centroid of the area.

**Census Tract:** A physical area used by the U.S. Census Bureau to compile population and other statistical data.

**Chronic Exposure:** Long-term exposure, usually lasting one year to a lifetime.

**Chronic Health Effect:** An adverse non-cancer health effect that develops and persists (e.g., months or years) over time after long-term exposure to a substance

**Criteria Air Pollutant:** a pollutant or precursor to a pollutant for which the U.S. Environmental Protection Agency or the Air Resources Board has established an Ambient Air Quality Standard (AAQS). Examples include ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, and $PM_{10}$ and $PM_{2.5}$.

**Default:** A value used when specific information that applies to a specific situation is not available.

**Developmental toxicity:** Adverse effects on the developing organism that may result from exposure prior to conception (either parent), during prenatal development, or postnatally to the time of sexual maturation. Adverse developmental effects may be detected at any point in the life span of the organism. Major manifestations of developmental toxicity include: death of the developing organism; induction of structural birth defects; altered growth; and functional deficiency.

**Dilution factor (c/Q):** a site-specific quantity defined as a ratio of the ground level concentration in $\mu g/m^3$ to the mass emission rate in g/s and represented by c/Q.

**Dose:** A calculated amount of a substance estimated to be received by the subject, whether human or animal, as a result of exposure. Doses are generally expressed in terms of amount of chemical per unit body weight; typical units are mg/kg-day.

**Dose-response assessment:** The process of characterizing the relationship between the exposure to an agent and the incidence of an adverse health effect in exposed populations.

**DTSC:** California Department of Toxic Substances Control

**ED:** Rural Enumeration District. A geographical unit smaller than a census tract used to report census data. EDs contain roughly 1,100 persons.

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**Emission Inventory Criteria and Guidelines:** Regulation and Report adopted by the California Air Resources Board specifying criteria and procedures for the preparation of Air Toxics Hot Spots Act Emission Inventory Reports (Title 17, California Code or Regulations, Sections 93300-93300.5)

**Endpoint:** An observable or measurable biological or biochemical event including cancer used as an index of the effect of a chemical on a cell, tissue, organ, organism, etc.

**Epidemiology:** The study of the occurrence and distribution of a disease or physiological condition in human populations and of the factors that influence this distribution.

**Exposure:** Contact of an organism with a chemical, physical, or biological agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, digestive tract) and available for absorption.

**Exposure Pathway:** A route of exposure by which xenobiotics enter the human body, (e.g., inhalation, ingestion, dermal absorption).

**Fugitive Dust:** Dust particles that are introduced into the air through certain activities such as soil cultivation, or vehicles operating on open fields or dirt roadways. A subset of fugitive emissions.

**Fugitive Emissions:** Emissions not caught by a capture system which are often due to equipment leaks, evaporative processes, and windblown disturbances.

**Gaussian Model:** An air dispersion model based on the assumption that the time-averaged concentration of a species emitted from a point source has a Gaussian distribution about the mean centerline.

**Genotoxic:** having an adverse effect on the genetic material (DNA) resulting in a mutation or in chromosome damage

**GLC:** Estimated ground level concentration, usually for a specified averaging time (e.g., annual average, 1 hour, etc.)

**Hot Spots Analysis and Reporting Program (HARP):** A single integrated software package designed to promote statewide consistency, efficiency, and cost-effective implementation of health risk assessments and the Hot Spots Program. The HARP software package consists of three modules that include: 1) the Emissions Inventory Database Module, 2) the Air Dispersion Modeling Module, and 3) the Risk Analysis and Mapping Module.

**Health Risk Assessment (HRA):** the name of a computer program developed by the ARB, the OEHHA, and the University of California which was designed to aid in the computation of risk in the Hot Spots program

**HSC:** Health and Safety Code of the State of California

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**Haber's Law:** The product of the concentration (C) and time of exposure (t) required to produce a specific physiologic effect is equal to a constant level or severity of response (K), or C * t = K

**Hazard identification:** The process of determining whether exposure to an agent can cause an increase in the incidence of an adverse health effect including cancer

**Health Risk Assessment:** A health risk assessment (HRA) is an evaluation or report that a risk assessor (e.g., Air Resources Board, district, consultant, or facility operator) develops to describe the potential a person or population may have of developing adverse health effects from exposure to a facility's emissions. Some health effects that are evaluated could include cancer, developmental effects, or respiratory illness. The pathways that can be included in an HRA depend on the toxic air pollutants that a person (receptor) may be exposed to, and can include breathing, the ingestion of soil, water, crops, fish, meat, milk, and eggs, and dermal exposure.

**Health Risk Guidance Value (HRGV):** A numerical value with which to compare an exposure level in order to determine the probability of occurrence of an adverse health effect. In the Hot Spots program the toxicity criteria or toxicity values are known as Reference Exposure Levels (RELs) for noncancer effects and as inhalation unit risk factors and cancer potency values for cancer effects.

**Hazard Index (HI):** The sum of individual acute or chronic hazard quotients (HQs) for each substance affecting a particular toxicological endpoint.

**Hazard Quotient (HQ):** The estimated ground level concentration divided by the reference exposure level for a single substance and a particular endpoint. For an acute HQ the one hour maximum concentration is divided by the acute Reference Exposure Level for the substance. For a chronic HQ, the annual concentration is divided by the chronic Reference Exposure level.

**Hot Spot:** A location where emissions from specific sources may expose individuals and population groups to elevated risks of adverse health effects, including but not limited to cancer, and contribute to the cumulative health risks of emissions from other sources in the area.

**Individual Excess Cancer Risk:** The theoretical probability of an individual person developing cancer as a result of lifetime exposure to carcinogenic substances. The Individual Excess Cancer Risk is calculated by summing the potential cancer risks due to both inhalation and noninhalation routes of exposure.

**Inhalation (Breathing) Rate:** The amount of air inhaled in a specified time period (e.g., per minute, per hour, per day, etc.); also called breathing rate and ventilation rate. This is an example of a variate.

**Inhalation unit risk factor:** The theoretical upper bound probability of extra cancer cases occurring in the exposed population assuming a lifetime exposure to the chemical when the air concentration is expressed in exposure units of per microgram/cubic meter $(\mu g/m^3)^{-1}$.

**Initiator carcinogen:** A substance which causes the first stage of carcinogenesis, the conversion of a normal cell to a neoplastic cell. Initiation is considered to be a rapid, irreversible change often involving a change in the DNA caused by the initiator.

**Interspecies:** Between different species.

**Intraspecies:** Within the same species.

**Industrial Source Complex Dispersion model (ISC3):** Air modeling software that incorporates three previous programs into a single program. These are the short-term model (ISCST), the long term model (ISCLT), and the complex terrain model (COMPLEX).

**Isopleth:** A line on a map connecting points of equal value (e.g., risk, concentration, etc.).

**Lowest-observed adverse effect level (LOAEL):** The lowest dose or exposure level of a chemical in a study at which there is a statistically or biologically significant increase in the frequency or severity of an adverse effect in the exposed population as compared with an appropriate, unexposed control group.

**Margin of safety:** The ratio of the no-observed-adverse-effect level (NOAEL) to the estimated human exposure.

**Mean:** The arithmetic average.

**MEI:** Maximum exposed individual (theoretical)

**MEIR:** Maximum exposed individual resident (actual)

**MEIW:** Maximum exposed individual worker (actual)

**Meteorology:** The science that deals with the phenomena of the atmosphere especially weather and weather conditions. In the area of air dispersion modeling, *meteorology* is used to refer to climatological data needed to run an air dispersion model including: wind speed, wind direction, stability class and ambient temperature.

**Milligram:** One one-thousandth ($10^{-3}$) of a gram.

**Molecular formula:** The formula which identifies the atoms and the number of each kind in the molecules of a compound. Elements in the molecular formula are listed according to the Hill convention (C, H, then other elements in alphabetical order).

**Molecular weight:** The sum of the atomic weights of the atoms in a molecule. For example, methane ($CH_4$) is 16.043, the atomic weights being carbon = 12.011, hydrogen = 1.008.

**Monte Carlo simulation:** Application of random sampling to obtain an approximate value of an expression.

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**Multipathway substance:** A substance or chemical that once airborne from an emission source can, under environmental conditions, be taken into a human receptor by inhalation and by other exposure routes such as after deposition on skin or after ingestion of soil contaminated by the emission

**No Observed Adverse Effect Level (NOAEL):** The highest experimental dose at which there is no statistically or biologically significant increase in frequency or severity of adverse health effects in the exposed population compared with an appropriate, unexposed population. Effects may be produced at this level, but they are not considered to be adverse. Substances are generally considered to not have a NOAEL for the cancer endpoint.

**Noncarcinogenic Effects:** Noncancer health effects which may include birth defects, organ damage, morbidity, and death.

**Office of Environmental Health Hazard Assessment (OEHHA):** An office within the California Environmental Protection Agency that is responsible for evaluating chemicals for adverse health impacts and establishing safe exposure levels. OEHHA also assists in performing health risk assessments and developing risk assessment procedures for air quality management purposes.

**$PM_{10}$, $PM_{2.5}$:** $PM_{10}$ is particulate matter less than 10 μm in diameter; $PM_{2.5}$ is particulate matter less than 2.5 μm in diameter.

**PMI:** Off-site point of maximum impact. A location, with or without people currently present, at which the total cancer risk, or the total noncancer risk, has the highest numerical value.

**Point Estimate:** A single value estimate for a given variate

**Potency:** Essentially the relative effectiveness, or risk, of a standard amount of a substance to cause a toxic response.

**Potency Slope:** Used to calculate the probability or risk of cancer associated with an estimated exposure, based on the assumption in cancer risk assessments that risk is directly proportional to dose and that there is no threshold for carcinogenesis. It is the slope of the dose-response curve estimated at low exposures.

**Proposition 65:** Safe Drinking Water and Toxic Enforcement Act of 1986, also known as Proposition 65. This Act is codified in California Health and Safety Code Section 25249.5, et seq. No person in the course of doing business shall knowingly discharge or release a chemical known to the state to cause cancer or reproductive toxicity into water or into land where such chemical passes or probably will pass into any source of drinking water, without first giving clear and reasonable warning to such individual.

**Resource Conservation and Recovery Act (RCRA) of 1976:** A federal law regulating disposal of hazardous waste

**Receptor:** A location with or without people present at which the ground level concentration of an emitted chemical can be estimated

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**Refined Models:** Air dispersion models designed to provide more representative concentration estimates than screening models taking into account actual meteorological conditions.

**Reference Concentration (RfC):** An estimate, derived by the U.S. EPA (with an uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population, (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. The RfC is derived from a no or lowest observed adverse effect level from human or animal exposures, to which uncertainty or "safety" factors are applied.

**Reference Dose (RfD):** An estimate delivered by the U.S. EPA (with uncertainty spanning perhaps an order of magnitude) of the daily exposure to the human population (including sensitive subpopulations) that is likely to be without deleterious effects during a lifetime. The RfD is reported in units of mg of substance/kg body weight/day for oral exposures.

**Reference exposure level (REL):** expressed in units of $\mu g/m^3$ for inhalation exposures and of mg/kg-d for noninhalation exposures. The REL is an exposure level at or below which no noncancer adverse health effect is anticipated to occur in a human population exposed for a specific duration. An REL is virtually the same as the terms Reference Concentration (RfC) for inhalation or Reference Dose (RFD) used by U.S. EPA, only it may be for varying amounts of time rather than lifetime only. It has been given a different name so that the values estimated by the State Office of Environmental Health Hazard Assessment can easily be distinguished from those developed by the U.S. EPA. RELs are used to evaluate toxicity endpoints other than cancer.

**Reproductive toxicity:** Harmful effects on fertility, gestation, or offspring, caused by exposure of either parent to a substance.

**Risk:** The (characterization of the) probability of potentially adverse effects to human health, in this instance from the exposure to environmental hazards.

**Risk Assessment:** The characterization (in the present context) of the probability of potentially adverse health effects to people from exposure to environmental chemical hazards.

**Risk Management:** An evaluation of the need for and feasibility of reducing risk. It includes consideration of magnitude of risk, available control technologies, and economic feasibility.

**Risk Management and Prevention Program (RMPP):** A program administered by the Office of Emergency Services (OES) and local agencies to reduce the frequency and severity of accidental releases of toxic materials

**Scientific Review Panel on Toxic Air Contaminants or SRP:** A nine-member panel appointed to advise the Air Resources Board and the Department of Pesticide Regulation in their evaluation of the adverse health effects toxicity of substances being evaluated as Toxic Air Contaminants.

**Screening Models:** Dispersion models used to provide a maximum concentration that is likely to overestimate public exposure.

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

**Sensitive Receptor:** A location such as a hospital or daycare center where the human occupants are considered to be more sensitive to pollutants than "average".

**Severity Level:** The (acute) discomfort or mild effect level; the concentration of an airborne substance at or below which exposure for one hour may result in some odors, tastes, visual cues, and sensations but which will cause no adverse health effects in essentially all of the population. Exposure to concentrations above this level, depending on the chemical, may result in minor health effects, such as mild eye and respiratory irritation, skin irritation, minor histologic effects, and headaches.

**Severity Level II:** The (acute) disability or serious effect level. Exposure for one hour to an airborne substance above this level may lead individuals to seek assistance. Exposures above this level, depending on the chemical, may result in serious health effects such as severe eye irritation, severe respiratory irritation, bronchospasm, shortness of breath, disorientation, blurred vision, vomiting, cardiac arrhythmia and adverse outcomes of an existing or subsequent pregnancy.

**Stationary source:** A non-mobile source of air pollutants which can be either a point or area source.

**Stochastic:** A process that involves random variation

**Synergism:** A pharmacologic or toxicologic interaction in which the combined effect of two or more chemicals is greater than the sum of the effects of each chemical alone.

**Subcensus Tract:** Smaller population unit within a census tract.

**Surrogate:** As used in this document refers to a single substance category used to represent a family of related chemical compounds, e.g., gasoline vapors or POM (polycyclic organic matter) in place of benzo(a)pyrene.

**Threshold, Nonthreshold:** A threshold dose is the minimally effective dose of any chemical that is observed to produce a response (e.g., enzyme change, liver toxicity, death). For most toxic effects, except carcinogenesis, there appear to be threshold doses. Nonthreshold substances are those substances, including nearly all carcinogens, that are known or assumed to have some risk of response at any dose above zero.

**Toxic air contaminant (TAC):** As defined by California Health and Safety Code, Section 39655 (a): an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. Substances, which have been identified by the United States Environmental Protection Agency as hazardous air pollutants (e.g. benzene, asbestos), shall be identified by the Board as toxic air contaminants.

**Toxicology:** The multidisciplinary study of toxicants, their harmful effects on biological systems, and the conditions under which these harmful effects occur. The mechanisms of action, detection, and treatment of the conditions produced by toxicants are studied.

**Uncertainty:** True uncertainty is that which is not known about a factor that influences its value.

The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments. August 2003.

**URF:** See inhalation unit risk factor

**UTM Coordinates:** Universal Transfer Mercator Coordinates. Coordinates used to define a specific location by means of two values (i.e., easting and northing coordinates).

**United States Environmental Protection Agency (U.S. EPA):** The Federal agency charged with setting policy and guidelines, carrying out legal mandates, for the protection, and national interests in environmental resources.

**Vapor:** The gaseous phase of liquids or solids at atmospheric temperature and pressure.

**Vapor Pressure:** The pressure exerted by a chemical vapor in equilibrium with its liquid or solid phase at any given temperature, used to calculate the rate of evaporation of a substance.

**Variability:** Ability to have different numerical values of a parameter, such as height or weight

**Variate:** A variable quantity associated with a probability distribution (e.g. inhalation rate)

**Volatile:** Chemicals that rapidly pass off from the liquid state in the form of vapors.

**Xenobiotic:** A toxic agent; a relatively small (MW<1000), non-nutritive chemical that is foreign to the species being studied

**Zone of impact:** The area in the vicinity of the facility in which an individual is exposed to a specified cancer risk, usually one in a million or greater.

# Appendix K

## HRA Forms and Maps Used With Air Dispersion Modeling

**- Example of Census Tract Map**

**- Example of 7.5 minute Series Map**

**- Examples of Tables for Emissions Reporting**

Figure 1
Census Tracts, View 1

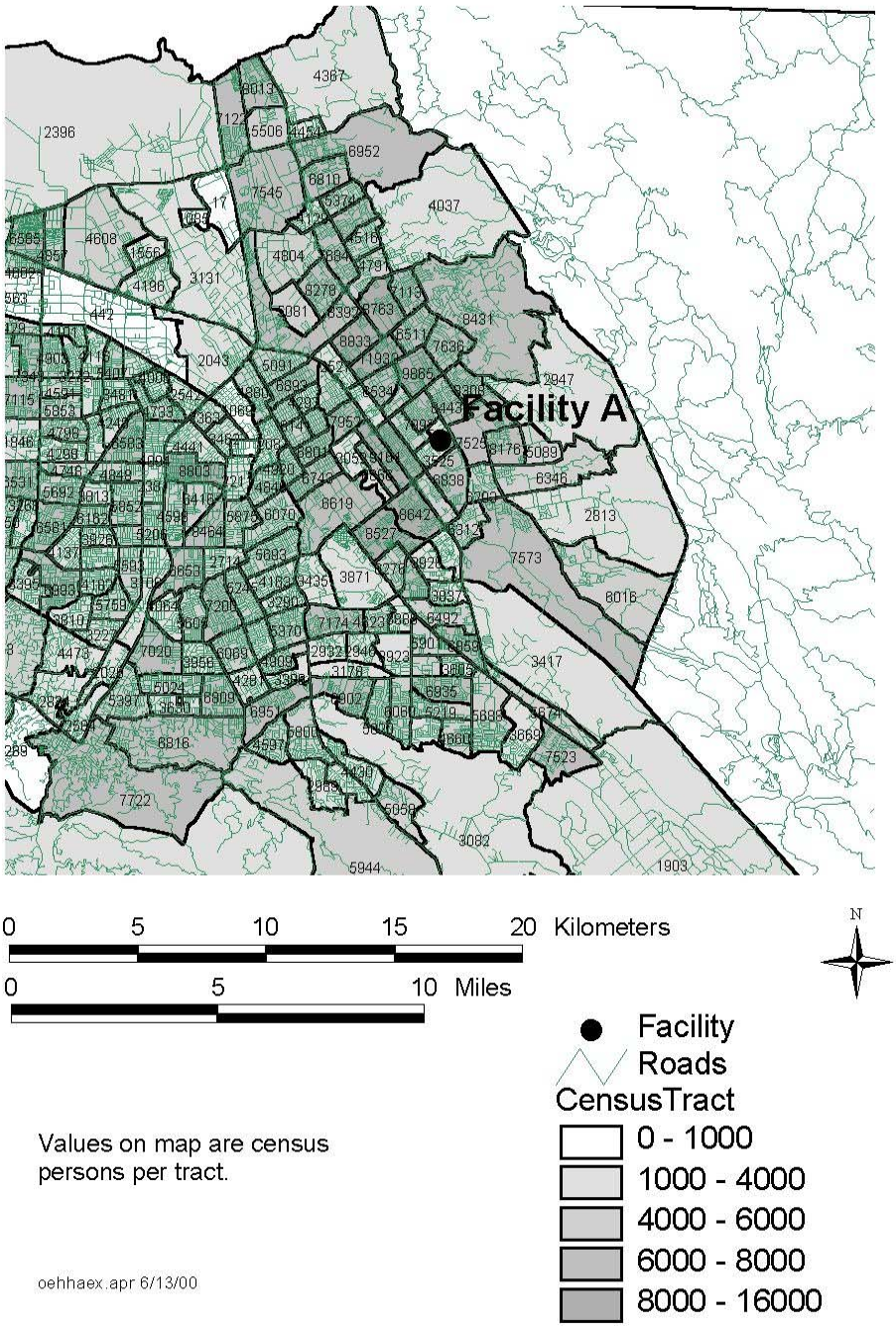


Figure 2
Census Tracts, View 2

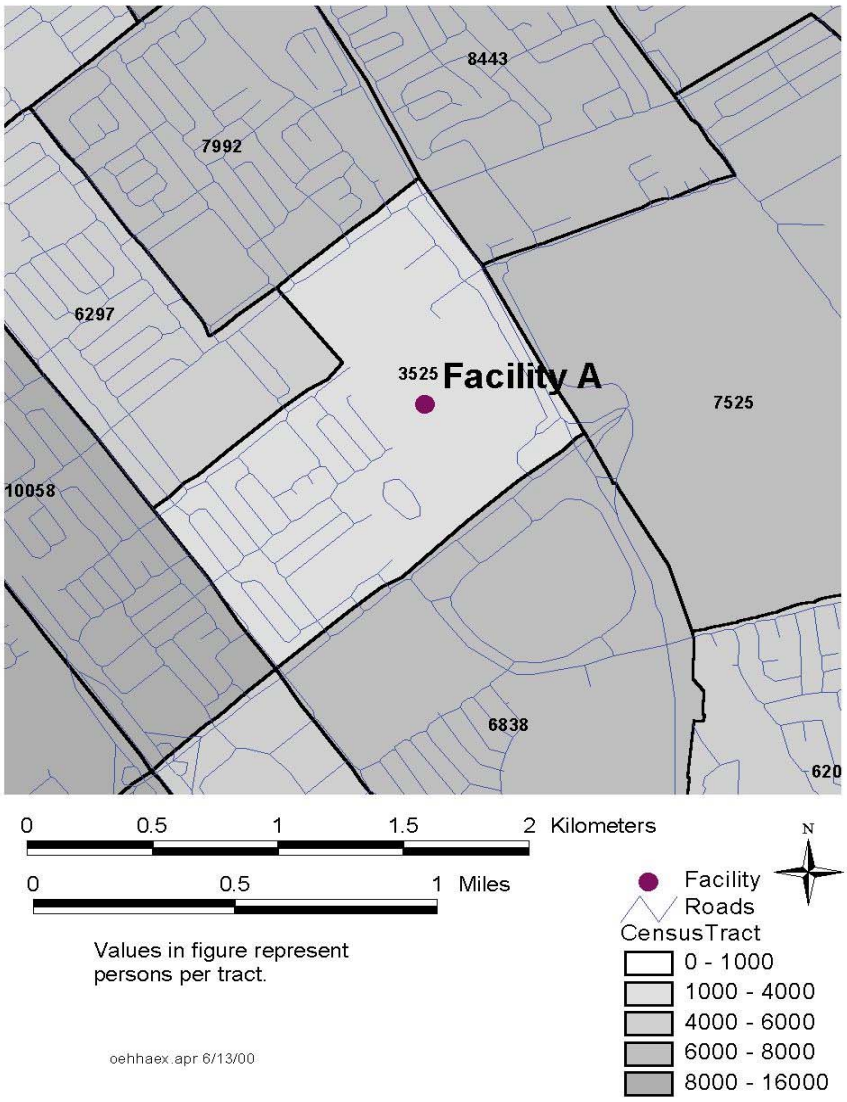
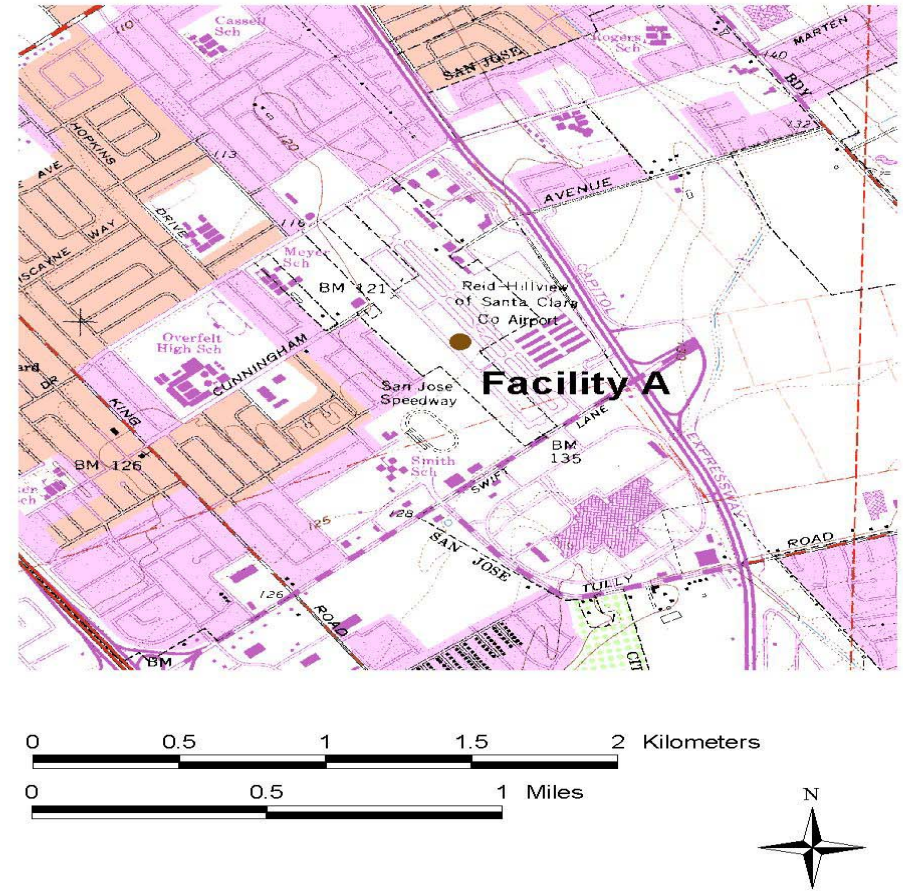


Figure 4
USGS 7.5 Minute Topographic Map

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# HEALTH RISK ASSESSMENT

### EMISSION RATE BY SUBSTANCE AND SOURCE RAG-001

| FACILITY NAME / FACILITY ADDRESS / SITE ID#: |
|---|

| SOURCE ID No. | SOURCE NAME | SUBSTANCE NAME | CAS No. | 1-HOUR MAXIMUM (lb/hr) | 1-HOUR MAXIMUM (g/s) | ANNUAL AVERAGE (lb/yr) | ANNUAL AVERAGE (g/s) |
|---|---|---|---|---|---|---|---|
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# HEALTH RISK ASSESSMENT

### EMISSION RATE BY SUBSTANCE – TOTALS – RAG-002

| FACILITY NAME / FACILITY<br>ADDRESS / SITE ID# |
|---|

| SUBSTANCE NAME | CAS No. | 1-HOUR MAXIMUM (lb/hr) | 1-HOUR MAXIMUM (g/s) | ANNUAL AVERAGE (lb/yr) | ANNUAL AVERAGE (g/s) |
|---|---|---|---|---|---|
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# HEALTH RISK ASSESSMENT

**SOURCE PARAMETERS – STACKS – RAG-003**

| FACILITY NAME / FACILITY ADDRESS / SITE ID# |
|---|

| SOURCE ID No. | STACK NAME | UTM Easting | UTM Northing | HEIGHT (m) | DIAMETER (m) | TEMP. (F) | TEMP. (K) | FLOW RATE (ACFM) | EXIT VEL. (m/s) |
|---|---|---|---|---|---|---|---|---|---|
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# HEALTH RISK ASSESSMENT

### SOURCE OPERATING HOURS – RAG-004

| FACILITY NAME / FACILITY ADDRESS / SITE ID# |
|---|

| SOURCE ID No. | STACK NAME | AVERAGE OPERATING HOURS | | MAXIMUM OPERATING HOURS | |
|---|---|---|---|---|---|
| | | (hr/day) | (days/year) | (hr/day) | (days/year) |
| | | | | | |
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# Appendix L

# OEHHA/ARB Approved Health Values
# for Use in Hot Spot Facility Risk Assessments

## Purpose of the Appendix L Tables:

The purpose of the following reference tables is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics Hot Spots Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993*.

The following tables list the OEHHA adopted inhalation and oral cancer slope factors, noncancer acute Reference Exposure Levels (RELs), and inhalation and oral noncancer chronic RELs. In addition, these tables list the substances in Appendix A-I *(Substances For Which Emissions Must Be Quantified*) and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Hot Spots Emission Inventory Criteria and Guidelines (EICG).* OEHHA is still in the process of adopting new noncancer chronic RELs. Therefore, new health values will periodically be added to, or deleted from, these tables. Users of these tables are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values.

Substances written in *italics* do not have explicit OEHHA approved health values, but are included in this table to clarify applicability of OEHHA adopted heath effects values to individual or grouped substances listed in the *Hot Spots Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances For Which Emissions Must Be Quantified."*

The "Date Value Reviewed" column lists the date that the health value was last reviewed by OEHHA and the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics Hot Spots Program. This information is useful to tell where the number came from. If the health value is unchanged since it was first approved for use in the Hot Spots Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].

- April 1999 is listed for the cancer potency values and noncancer acute RELs, which have been adopted by the OEHHA as part of the AB 2588 "Hot Spots" Risk Assessment Guidelines.
- February 2000, April 2000, January 2001, and December 2001 are listed for the first set of 22, the second set of 16, the third set of 22, and the fourth set of 12 noncancer chronic RELs, respectively.
- October 2000 is listed for the oral chronic RELs and oral cancer slope factors. 1996 is listed for the U.S. EPA Reference Concentrations. Dates of 1990-1992 and 1996 are listed for CAPCOA chronic RELs that may eventually be dropped or replaced.
- For the substances identified as Toxic Air Contaminants, the Air Resources Board hearing date is listed. The dates for acetaldehyde, benzo[a]pyrene, and methyl tertiary-butyl ether represent the dates the values were approved by the Scientific Review Panel.

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| ACETALDEHYDE | 75-07-0 | | | 9.0E+00 | 5/93 | | | 1.0E-02 | 4/99 [5/93] | | | 1 |
| ACETAMIDE | 60-35-5 | | | | | | | 7.0E-02 | 4/99 | | | 1 |
| ACROLEIN | 107-02-8 | 1.9E-01 | 4/99 | 6.0E-02 | 1/01 | | | | | | | -- |
| ACRYLAMIDE | 79-06-1 | | | | | | | 4.5E+00 | 4/99 [7/90] | | | 1 |
| ACRYLIC ACID | 79-10-7 | 6.0E+03 | 4/99 | | | | | | | | | -- |
| ACRYLONITRILE | 107-13-1 | | | 5.0E+00 | 12/01 | | | 1.0E+00 | 4/99 [1/91] | | | 1 |
| ALLYL CHLORIDE | 107-05-1 | | | | | | | 2.1E-02 | 4/99 | | | 1 |
| 2-AMINOANTHRAQUINONE | 117-79-3 | | | | | | | 3.3E-02 | 4/99 | | | 1 |
| AMMONIA | 7664-41-7 | 3.2E+03 | 4/99 | 2.0E+02 | 2/00 | | | | | | | -- |
| ANILINE | 62-53-3 | | | | | | | 5.7E-03 | 4/99 | | | 1 |
| *Antimony Compounds* | *7440-36-0* | | | | | | | | | | | -- |
| ANTIMONY TRIOXIDE | 1309-64-4 | | | | | | | | | | | -- |
| ARSENIC AND COMPOUNDS (INORGANIC) TAC ♣ | 7440-38-2 1016 [1015] | 1.9E-01 AveP | 4/99 | 3.0E-02 | 1/01 | 3.0E-04 | 10/00 | 1.2E+01 TAC | 7/90 | 1.5E+00 | 10/00 | 1 |
| ARSINE | 7784-42-1 | 1.6E+02 | 4/99 | | | | | | | | | -- |
| ASBESTOS TAC ¤ | 1332-21-4 | | | | | | | 1.9E-04 TAC¤ | 3/86 | | | 333.33 ¤ |
| BENZENE TAC | 71-43-2 | 1.3E+03 AveP | 4/99 | 6.0E+01 | 2/00 | | | 1.0E-01 TAC | 1/85 | | | 1 |
| BENZIDINE (AND ITS SALTS) *values also apply to:* | 92-87-5 | | | | | | | 5.0E+02 | 4/99 [1/91] | | | 1 |
| *Benzidine based dyes* | *1020* | | | | | | | *5.0E+02* | *4/99 [1/91]* | | | *1* |
| *Direct Black 38* | *1937-37-7* | | | | | | | *5.0E+02* | *4/99 [1/91]* | | | *1* |
| *Direct Blue 6* | *2602-46-2* | | | | | | | *5.0E+02* | *4/99 [1/91]* | | | *1* |
| *Direct Brown 95 (technical grade)* | *16071-86-6* | | | | | | | *5.0E+02* | *4/99 [1/91]* | | | *1* |
| BENZYL CHLORIDE | 100-44-7 | 4E+02 | 4/99 | | | | | 1.7E-01 | 4/99 | | | 1 |
| BERYLLIUM AND COMPOUNDS ♣ | 7440-41-7 [1021] | | | 7.0E-03 | 12/01 | 2.0E-03 | 12/01 | 8.4E+00 | 4/99 [7/90] | | | 1 |
| BIS(2-CHLOROETHYL)ETHER (Dichloroethyl ether) | 111-44-4 | | | | | | | 2.5E+00 | 4/99 | | | 1 |
| BIS(CHLOROMETHYL)ETHER | 542-88-1 | | | | | | | 4.6E+01 | 4/99 [1/91] | | | 1 |
| 1,3-BUTADIENE TAC | 106-99-0 | | | 2.0E+01 | 1/01 | | | 6.0E-01 TAC | 7/92 | | | 1 |

## APPENDIX L - TABLE 1
## OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| CADMIUM AND COMPOUNDS TAC ♣ | 7440-43-9 [1045] | | | 2.0E-02 | 1/01 | 5.0E-04 | 10/00 | 1.5E+01 TAC | 1/87 | | | 1 |
| CARBON DISULFIDE | 75-15-0 | 6.2E+03 AveP | 4/99 | 8.0E+02 RfC | | | | | | | | -- |
| CARBON MONOXIDE | 630-08-0 | 2.3E+04 | 4/99 | | | | | | | | | -- |
| CARBON TETRACHLORIDE TAC (Tetrachloromethane) | 56-23-5 | 1.9E+03 AveP | 4/99 | 4.0E+01 | 1/01 | | | 1.5E-01 TAC | 9/87 | | | 1 |
| CHLORINATED PARAFFINS | 108171-26-2 | | | | | | | 8.9E-02 | 4/99 | | | 1 |
| CHLORINE | 7782-50-5 | 2.1E+02 | 4/99 | 2.0E-01 | 2/00 | | | | | | | -- |
| CHLORINE DIOXIDE | 10049-04-4 | | | 6.0E-01 | 1/01 | | | | | | | -- |
| 4-CHLORO-O-PHENYLENEDIAMINE | 95-83-0 | | | | | | | 1.6E-02 | 4/99 | | | 1 |
| CHLOROBENZENE | 108-90-7 | | | 1.0E+03 | 1/01 | | | | | | | -- |
| CHLORODIFLUOROMETHANE ... (see Fluorocarbons) | | | | | | | | | | | | |
| CHLOROFORM TAC | 67-66-3 | 1.5E+02 AveP | 4/99 | 3.0E+02 | 4/00 | | | 1.9E-02 TAC | 12/90 | | | 1 |
| *Chlorophenols* | *1060* | | | | | | | | | | | -- |
| PENTACHLOROPHENOL | 87-86-5 | | | | | | | 1.8E-02 | 4/99 | | | 1 |
| 2,4,6-TRICHLOROPHENOL | 88-06-2 | | | | | | | 7.0E-02 | 4/99 [1/91] | | | 1 |
| CHLOROPICRIN | 76-06-2 | 2.9E+01 | 4/99 | 4.0E-01 | 12/01 | | | | | | | -- |
| CHLOROPRENE | 126-99-8 | | | | | | | | | | | -- |
| p-CHLORO-o-TOLUIDINE | 95-69-2 | | | | | | | 2.7E-01 | 4/99 | | | 1 |
| CHROMIUM 6+ TAC ♣ *values also apply to:* | 18540-29-9 | | | 2.0E-01 | 1/01 | 2.0E-02 | 10/00 | 5.1E+02 TAC | 1/86 | | | 1 |
| *Barium chromate♣* | *10294-40-3* | | | *2.0E-01* | *1/01* | *2.0E-02* | *10/00* | *5.1E+02* TAC | *1/86* | | | *0.2053* |
| *Calcium chromate♣* | *13765-19-0* | | | *2.0E-01* | *1/01* | *2.0E-02* | *10/00* | *5.1E+02* TAC | *1/86* | | | *0.3332* |
| *Lead chromate♣* | *7758-97-6* | | | *2.0E-01* | *1/01* | *2.0E-02* | *10/00* | *5.1E+02* TAC | *1/86* | | | *0.1609* |
| *Sodium dichromate♣* | *10588-01-9* | | | *2.0E-01* | *1/01* | *2.0E-02* | *10/00* | *5.1E+02* TAC | *1/86* | | | *0.397* |
| *Strontium chromate♣* | *7789-06-2* | | | *2.0E-01* | *1/01* | *2.0E-02* | *10/00* | *5.1E+02* TAC | *1/86* | | | *0.2554* |
| CHROMIUM TRIOXIDE ♣ (as chromic acid mist) | 1333-82-0 | | | 2.0E-03 | 1/01 | 2.0E-02 | 10/00 | 5.1E+02 TAC | 1/86 | | | 0.52 |
| COPPER AND COMPOUNDS | 7440-50-8 [1067] | 1.0E+02 | 4/99 | | | | | | | | | -- |
| p-CRESIDINE | 120-71-8 | | | | | | | 1.5E-01 | 4/99 | | | 1 |
| CRESOLS (mixtures of) | 1319-77-3 | | | 6.0E+02 | 1/01 | | | | | | | -- |
| m-CRESOL | 108-39-4 | | | 6.0E+02 | 1/01 | | | | | | | -- |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| o-CRESOL | 95-48-7 | | | 6.0E+02 | 1/01 | | | | | | | -- |
| p-CRESOL | 106-44-5 | | | 6.0E+02 | 1/01 | | | | | | | -- |
| CUPFERRON | 135-20-6 | | | | | | | 2.2E-01 | 4/99 | | | 1 |
| *Cyanide Compounds (inorganic)* | *57-12-5 1073* | *3.4E+02* | *4/99* | *9.0E+00* | *4/00* | | | | | | | -- |
| HYDROGEN CYANIDE (Hydrocyanic acid) | 74-90-8 | 3.4E+02 | 4/99 | 9.0E+00 | 4/00 | | | | | | | -- |
| 2,4-DIAMINOANISOLE | 615-05-4 | | | | | | | 2.3E-02 | 4/99 | | | 1 |
| 2,4-DIAMINOTOLUENE | 95-80-7 | | | | | | | 4.0E+00 | 4/99 | | | 1 |
| 1,2-DIBROMO-3-CHLOROPROPANE (DBCP) | 96-12-8 | | | | | | | 7.0E+00 | 4/99 [1/92] | | | 1 |
| p-DICHLOROBENZENE | 106-46-7 | | | 8.0E+02 | 1/01 | | | 4.0E-02 | 4/99 [1/91] | | | 1 |
| 3,3-DICHLOROBENZIDINE | 91-94-1 | | | | | | | 1.2E+00 | 4/99 [1/91] | | | 1 |
| 1,1,-DICHLOROETHANE (Ethylidene dichloride) | 75-34-3 | | | | | | | 5.7E-03 | 4/99 | | | 1 |
| 1,1-DICHLOROETHYLENE … (see Vinylidene Chloride) | | | | | | | | | | | | |
| DI(2-ETHYLHEXYL)PHTHALATE (DEHP) | 117-81-7 | | | | | | | 8.4E-03 | 4/99 [1/92] | 8.4E-03 | 10/00 | 1 |
| DIESEL EXHAUST … (see Particulate Emissions from Diesel-Fueled Engines) | | | | | | | | | | | | |
| DIETHANOLAMINE | 111-42-2 | | | 3.0E+00 | 12/01 | | | | | | | -- |
| DIMETHYLAMINE | 124-40-3 | | | | | | | | | | | -- |
| p-DIMETHYLAMINOAZOBENZENE | 60-11-7 | | | | | | | 4.6E+00 | 4/99 | | | 1 |
| N,N-DIMETHYL FORMAMIDE | 68-12-2 | | | 8.0E+01 | 1/01 | | | | | | | -- |
| 2,4-DINITROTOLUENE | 121-14-2 | | | | | | | 3.1E-01 | 4/99 | | | 1 |
| 1,4-DIOXANE (1,4-Diethylene dioxide) | 123-91-1 | 3.0E+03 | 4/99 | 3.0E+03 | 4/00 | | | 2.7E-02 | 4/99 [1/91] | | | 1 |
| EPICHLOROHYDRIN (1-Chloro-2,3-epoxypropane) | 106-89-8 | 1.3E+03 | 4/99 | 3.0E+00 | 1/01 | | | 8.0E-02 | 4/99 [1/92] | | | 1 |
| 1,2-EPOXYBUTANE | 106-88-7 | | | 2.0E+01 | 1/01 | | | | | | | -- |
| ETHYL ACRYLATE | 140-88-5 | | | | | | | | | | | -- |
| ETHYL BENZENE | 100-41-4 | | | 2.0E+03 | 2/00 | | | | | | | -- |
| ETHYL CHLORIDE (Chloroethane) | 75-00-3 | | | 3.0E+04 | 4/00 | | | | | | | -- |
| ETHYLENE DIBROMIDE TAC (1,2-Dibromoethane) | 106-93-4 | | | 8.0E-01 | 12/01 | | | 2.5E-01 TAC | 7/85 | | | 1 |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS**

| Substance | Chemical Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date Value Reviewed [Added] | MAF |
| ETHYLENE DICHLORIDE TAC (1,2-Dichloroethane) | 107-06-2 | | | 4.0E+02 | 1/01 | | | 7.2E-02 TAC | 9/85 | | | 1 |
| ETHYLENE GLYCOL | 107-21-1 | | | 4.0E+02 | 4/00 | | | | | | | -- |
| ETHYLENE GLYCOL BUTYL ETHER … (see Glycol ethers) | | | | | | | | | | | | |
| ETHYLENE OXIDE TAC (1,2-Epoxyethane) | 75-21-8 | | | 3.0E+01 | 1/01 | | | 3.1E-01 TAC | 11/87 | | | 1 |
| ETHYLENE THIOUREA | 96-45-7 | | | | | | | 4.5E-02 | 4/99 | | | 1 |
| *Fluorides* | *1101* | *2.4E+02* | *4/99* | *1.3E+01* | *8/03* | 4.0E-2 | 8/03 | | | | | -- |
| HYDROGEN FLUORIDE (Hydrofluoric acid) | 7664-39-3 | 2.4E+02 | 4/99 | 1.4E+01 | 8/031 | 4.0E-2 | | | | | | -- |
| FORMALDEHYDE TAC | 50-00-0 | 9.4E+01 | 4/99 | 3.0E+00 | 2/00 | | | 2.1E-02 TAC | 3/92 | | | 1 |
| GASOLINE VAPORS | 1110 | | | | | | | | | | | -- |
| GLUTARALDEHYDE | 111-30-8 | | | 8.0E-02 | 1/01 | | | | | | | -- |
| GLYCOL ETHERS | 1115 | | | | | | | | | | | |
| ETHYLENE GLYCOL MONOBUTYL ETHER – EGBE | 111-76-2 | 1.4E+04 | 4/99 | | | | | | | | | -- |
| ETHYLENE GLYCOL MONOETHYL ETHER – EGEE | 110-80-5 | 3.7E+02 AveP | 4/99[1/92] | 7.0E+01 | 2/00 | | | | | | | -- |
| ETHYLENE GLYCOL MONOETHYL ETHER ACETATE – EGEEA | 111-15-9 | 1.4E+02 AveP | 4/99 | 3.0E+02 | 2/00 | | | | | | | -- |
| ETHYLENE GLYCOL MONOMETHYL ETHER – EGME | 109-86-4 | 9.3E+01 AveP | 4/99 | 6.0E+01 | 2/00 | | | | | | | -- |
| ETHYLENE GLYCOL MONOMETHYL ETHER ACETATE – EGMEA | 110-49-6 | | | 9.0E+01 | 2/00 | | | | | | | -- |
| HEXACHLOROBENZENE | 118-74-1 | | | | | | | 1.8E+00 | 4/99 [1/91] | | | 1 |
| HEXACHLOROCYCLOHEXANES (mixed or technical grade) | 608-73-1 1120 | | | | | | | 4.0E+00 | 4/99 [1/91] | 4.0E+00 | 10/00 [1/92] | 1 |
| Alpha-HEXACHLOROCYCLOHEXANE | 319-84-6 | | | | | | | 4.0E+00 | 4/99 [1/91] | 4.0E+00 | 10/00 [1/92] | 1 |
| beta- HEXACHLOROCYCLOHEXANE | 319-85-7 | | | | | | | 4.0E+00 | 4/99 [1/91] | 4.0E+00 | 10/00 [1/92] | 1 |
| Gamma-HEXACHLOROCYCLOHEXANE (Lindane) | 58-89-9 | | | | | | | 1.1E+00 | 4/99 | 1.1E+00 | 10/00 | 1 |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| n-HEXANE | 110-54-3 | | | 7.0E+03 | 4/00 | | | | | | | -- |
| HYDRAZINE | 302-01-2 | | | 2.0E-01 | 1/01 | | | 1.7E+01 | 4/99 [7/90] | | | 1 |
| HYDROCHLORIC ACID (Hydrogen chloride) | 7647-01-0 | 2.1E+03 | 4/99 | 9.0E+00 | 2/00 | | | | | | | -- |
| HYDROGEN BROMIDE … (see Bromine & Compounds) | | | | | | | | | | | | |
| HYDROGEN CYANIDE … (see Cyanide & Compounds) | | | | | | | | | | | | |
| HYDROGEN FLUORIDE … (see Fluorides) | | | | | | | | | | | | |
| HYDROGEN SELENIDE … (see Selenium & Compounds) | | | | | | | | | | | | |
| HYDROGEN SULFIDE | 7783-06-4 | 4.2E+01 | 4/99[7/90] | 1.0E+01 | 4/00 | | | | | | | -- |
| ISOPHORONE | 78-59-1 | | | 2.0E+03 | 12/01 | | | | | | | -- |
| ISOPROPYL ALCOHOL (Isopropanol) | 67-63-0 | 3.2E+03 | 4/99 | 7.0E+03 | 2/00 | | | | | | | -- |
| LEAD AND COMPOUNDS[TAC ✶ ♣] (inorganic) *values also apply to:* | 7439-92-1 1128 [1130] | | | | | | | 4.2E-02 TAC | 4/97 | 8.5E-03 | 10/00 | 1 |
| *Lead acetate♣* | *301-04-2* | | | | | | | *4.2E-02* TAC | *4/97* | *8.5E-03* | *10/00* | *0.637* |
| *Lead phosphate♣* | *7446-27-7* | | | | | | | *4.2E-02* TAC | *4/97* | *8.5E-03* | *10/00* | *0.7659* |
| *Lead subacetate♣* | *1335-32-6* | | | | | | | *4.2E-02* TAC | *4/97* | *8.5E-03* | *10/00* | *0.7696* |
| LINDANE ... (see gamma-Hexachlorocyclohexane) | | | | | | | | | | | | |
| MALEIC ANHYDRIDE | 108-31-6 | | | 7.0E-01 | 12/01 | | | | | | | -- |
| MANGANESE AND COMPOUNDS | 7439-96-5 [1132] | | | 2.0E-01 | 4/00 | | | | | | | -- |
| MERCURY AND COMPOUNDS (INORGANIC) | 7439-97-6 [1133] | 1.8E+00 | 4/99 | $9.0^{E}$-02 | 2/00 | 3.0E-04 | 10/00 [1/92] | | | | | -- |
| *Mercuric chloride* | *7487-94-7* | *1.8E+00* | *4/99* | *9.0E-02* | *2/00* | *3.0E-04* | *10/00 [1/92]* | | | | | -- |
| MERCURY AND COMPOUNDS (ORGANIC) *values also apply to:* | N/A | | | | | | | | | | | |
| METHYL MERCURY | 593-74-8 | | | | | | | | | | | -- |
| METHANOL | 67-56-1 | 2.8E+04 | 4/99 | 4.0E+03 | 4/00 | | | | | | | -- |
| METHYL BROMIDE (Bromomethane) | 74-83-9 | 3.9E+03 | 4/99 | 5.0E+00 | 2/00 | | | | | | | -- |
| METHYL tertiary-BUTYL ETHER | 1634-04-4 | | | 8.0E+03 | 2/00 | | | 9.1E-04 | 11/99 | | | 1 |
| METHYL CHLOROFORM (1,1,1-Trichloroethane) | 71-55-6 | 6.8E+04 | 4/99 | 1.0E+03 | 2/00 | | | | | | | -- |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| METHYL ETHYL KETONE (2-Butanone) | 78-93-3 | 1.3E+04 | 4/99 | | | | | | | | | -- |
| METHYL ISOCYANATE | 624-83-9 | | | 1.0E+00 | 12/01 | | | | | | | -- |
| METHYL MERCURY ... (see Mercury & Compounds) | | | | | | | | | | | | |
| METHYL METHACRYLATE | 80-62-6 | | | | | | | | | | | -- |
| 4,4'-METHYLENE BIS (2-CHLOROANILINE) (MOCA) | 101-14-4 | | | | | | | 1.5E+00 | 4/99 | | | 1 |
| METHYLENE CHLORIDE TAC (Dichloromethane) | 75-09-2 | 1.4E+04 | 4/99 | 4.0E+02 | 2/00 | | | 3.5E-03 TAC | 7/89 | | | 1 |
| 4,4'-METHYLENE DIANILINE (AND ITS DICHLORIDE) | 101-77-9 | | | 2.0E+01 | 12/01 | | | 1.6E+00 | 4/99 | 1.6E+00 | 10/00 | 1 |
| METHYLENE DIPHENYL ISOCYANATE | 101-68-8 | | | 7.0E-01 | 1/01 | | | | | | | -- |
| MICHLER'S KETONE (4,4'-Bis(dimethylamino)benzophenone) | 90-94-8 | | | | | | | 8.6E-01 | 4/99 | | | 1 |
| N-NITROSO-n-BUTYLAMINE | 924-16-3 | | | | | | | 1.1E+01 | 4/99 [1/92] | | | 1 |
| N-NITROSODI-n-PROPYLAMINE | 621-64-7 | | | | | | | 7.0E+00 | 4/99 [1/91] | | | 1 |
| N-NITROSODIETHYLAMINE | 55-18-5 | | | | | | | 3.6E+01 | 4/99 [1/91] | | | 1 |
| N-NITROSODIMETHYLAMINE | 62-75-9 | | | | | | | 1.6E+01 | 4/99 [1/91] | | | 1 |
| N-NITROSODIPHENYLAMINE | 86-30-6 | | | | | | | 9.0E-03 | 4/99 | | | 1 |
| N-NITROSO-N-METHYLETHYLAMINE | 10595-95-6 | | | | | | | 2.2E+01 | 4/99 [7/90] | | | 1 |
| N-NITROSOMORPHOLINE | 59-89-2 | | | | | | | 6.7E+00 | 4/99 [7/92] | | | 1 |
| N-NITROSOPIPERIDINE | 100-75-4 | | | | | | | 9.4E+00 | 4/99 [7/92] | | | 1 |
| N-NITROSOPYRROLIDINE | 930-55-2 | | | | | | | 2.1E+00 | 4/99 [7/90] | | | 1 |
| NAPHTHALENE ... (see Polycyclic aromatic hydrocarbons) | | | | | | | | | | | | |
| NICKEL AND COMPOUNDS TAC ♣ *values also apply to:* | 7440-02-0 [1145] | 6.0E+00 | 4/99 | 5.0E-02 | 2/00 | 5.0E-02 | 10/00 | 9.1E-01 TAC | 8/91 | | | 1 |
| *Nickel acetate♣* | *373-02-4* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.3321* |
| *Nickel carbonate♣* | *3333-39-3* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.4945* |
| *Nickel carbonyl♣* | *13463-39-3* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.3438* |
| *Nickel hydroxide♣* | *12054-48-7* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.6332* |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| *Nickelocene♣* | *1271-28-9* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.4937* |
| NICKEL OXIDE♣ | 1313-99-1 | 6.0E+00 | 4/99 | 1.0E-01 | 2/00 | 5.0E-02 | 10/00 | 9.1E-01 TAC | 8/91 | | | 0.7859 |
| *Nickel refinery dust from the pyrometallurgical process* | *1146* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *1* |
| *Nickel subsulfide♣* | *12035-72-2* | *6.0E+00* | *4/99* | *5.0E-02* | *2/00* | *5.0E-02* | *10/00* | *9.1E-01* TAC | *8/91* | | | *0.2443* |
| NITRIC ACID | 7697-37-2 | 8.6E+01 | 4/99 | | | | | | | | | -- |
| NITROGEN DIOXIDE | 10102-44-0 | 4.7E+02 | 4/99[1/92] | | | | | | | | | -- |
| 2-NITROPROPANE | 79-46-9 | | | | | | | | | | | -- |
| p-NITROSODIPHENYLAMINE | 156-10-5 | | | | | | | 2.2E-02 | 4/99 | | | 1 |
| OZONE | 10028-15-6 | 1.8E+02 | 4/99[1/92] | | | | | | | | | -- |
| PARTICULATE EMISSIONS FROM DIESEL-FUELED ENGINES TAC ■ | 9901 | | | 5.0E+00 TAC | 8/98 | | | 1.1E+00 TAC | 8/98 | | | 1 |
| PENTACHLOROPHENOL ... (see Chlorophenols) | | | | | | | | | | | | |
| PERCHLOROETHYLENE TAC (Tetrachloroethylene) | 127-18-4 | 2.0E+04 | 4/99 | 3.5E+01 TAC | 10/91 | | | 2.1E-02 TAC | 10/91 | | | 1 |
| PHENOL | 108-95-2 | 5.8E+03 | 4/99 | 2.0E+02 | 4/00 | | | | | | | -- |
| PHOSGENE | 75-44-5 | 4.0E+00 | 4/99 | | | | | | | | | -- |
| PHOSPHINE | 7803-51-2 | | | 8.0E-01 | 9/02 | | | | | | | -- |
| PHOSPHORIC ACID | 7664-38-2 | | | 7.0E+00 | 2/00 | | | | | | | -- |
| PHTHALIC ANHYDRIDE | 85-44-9 | | | 2.0E+01 | 1/01 | | | | | | | -- |
| PCB (POLYCHLORINATED BIPHENYLS-unspeciated mixture) [lowest risk] ★ | 1336-36-3 | | | | | | | 7.0E-02 | 2/02 | 7.0E-02 | 2/02 | 1 |
| PCB (POLYCHLORINATED BIPHENYLS-unspeciated mixture) [low risk] ★ | 1336-36-3 | | | | | | | 4.0E-01 | 2/02 | 4.0E-01 | 2/02 | 1 |
| PCB (POLYCHLORINATED BIPHENYLS - unspeciated mixture) [high risk] ★ | 1336-36-3 | | | | | | | 2.0E+00 | 2/02 | 2.0E+00 | 2/02 | 1 |
| PCB (POLYCHLORINATED BIPHENYLS (speciated)∇ | | | | | | | | | | | | |
| 3,3',4,4'-TETRACHLOROBIPHENYL (77) | 35298-13-3 | | | 4.0E-01 | 8/03 | 1.0E –04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |
| 3,4,4',5-TETRACHLOROBIPHENYL (81) | 70362-50-4 | | | 4.0E-01 | 8/03 | 1.0E –04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |
| 2,3,3',4,4'- PENTACHLOROBIPHENYL (105) | 32598-14-4 | | | 4.0E-01 | 8/03 | 1.0E –04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |
| 2,3,4,4'5- PENTACHLOROBIPHENYL (114) | 74472-37-0 | | | 8.0E-02 | 8/03 | 2.0E –05 | 8/03 | 6.5E +01 | 8/03 | 6.5E +01 | 8/03 | |
| 2,3'4,4',5- PENTACHLOROBIPHENYL (118) | 31508-00-6 | | | 4.0E-01 | 8/03 | 1.0E –04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg-d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| 2',3,4,4',5- PENTACHLOROBIPHENYL (123) | 65510-44-3 | | | 4.0E-01 | 8/03 | 1.0E –04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |
| 3,3',4,4',5- PENTACHLOROBIPHENYL (126) | 57465-28-8 | | | 4.0E-04 | 8/03 | 1.0E –07 | 8/03 | 1.3E +04 | 8/03 | 1.3E +04 | 8/03 | |
| 2,3,3',4,4',5-HEXACHLOROBIPHENYL (156) | 38380-08-4 | | | 8.0E-02 | 8/03 | 2.0E –05 | 8/03 | 6.5E +01 | 8/03 | 6.5E +01 | 8/03 | |
| 2,3,3',4,4',5'-HEXACHLOROBIPHENYL (157) | 69782-90-7 | | | 8.0E-02 | 8/03 | 2.0E –05 | 8/03 | 6.5E +01 | 8/03 | 6.5E +01 | 8/03 | |
| 2,3',4,4',5,5'-HEXACHLOROBIPHENYL (167) | 52663-72-6 | | | 4.0E-00 | 8/03 | 1.0E –03 | 8/03 | 1.3E +00 | 8/03 | 1.3E +00 | 8/03 | |
| 3,3',4,4'5,5' - HEXACHLOROBIPHENYL (169) | 32774-16-6 | | | 4.0E-03 | 8/03 | 1.0E –06 | 8/03 | 1.3E +03 | 8/03 | 1.3E +03 | 8/03 | |
| 2,3,3'4,4',5,5' - HEPTACHLOROBIPHENYL (189) | 39635-31-9 | | | 4.0E-01 | 8/03 | 1.0 E-04 | 8/03 | 1.3E +01 | 8/03 | 1.3E +01 | 8/03 | |
| POLYCHLORINATED DIBENZO-*P*-DIOXINS (PCDD) (AS 2,3,7,8-PCDD EQUIVALENT)[TAC] ● | 1085 1086 | | | | | | | | | | | |
| 2,3,7,8-TETRACHLORODIBENZO-*P*-DIOXIN[TAC] | 1746-01-6 | | | 4.0E-05 | 2/00 | 1.0E-08 | 10/00 | 1.3E+05 TAC | 8/86 | 1.3E+05 TAC | 8/86 | 1 |
| 1,2,3,7,8-PENTACHLORODIBENZO-*P*-DIOXIN | 40321-76-4 | | | 8.0E-05 | 2/00 | 2.0E-08 | 10/00 | 1.3E+05 | 4/99 | 1.3E+05 | 10/00 | 1 |
| 1,2,3,4,7,8-HEXACHLORODIBENZO-*P*-DIOXIN | 39227-28-6 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,6,7,8-HEXACHLORODIBENZO-*P*-DIOXIN | 57653-85-7 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,7,8,9-HEXACHLORODIBENZO-*P*-DIOXIN | 19408-74-3 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,4,6,7,8-HEPTACHLORODIBENZO-*P*-DIOXIN | 35822-46-9 | | | 4.0E-03 | 2/00 | 1.0E-06 | 10/00 | 1.3E+03 | 4/99 | 1.3E+03 | 10/00 | 1 |
| 1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-*P*-DIOXIN | 3268-87-9 | | | 4.0E-02 | 2/00 | 1.0E-05 | 10/00 | 1.3E+01 | 4/99 | 1.3E+01 | 10/00 | 1 |
| POLYCHLORINATED DIBENZOFURANS (AS 2,3,7,8-PCDD EQUIVALENT) (PCDF) [TAC] ● | 1080 | | | | | | | | | | | |
| 2,3,7,8-TETRACHLORODIBENZOFURAN | 5120-73-19 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,7,8-PENTACHLORODIBENZOFURAN | 57117-41-6 | | | 8.0E-04 | 2/00 | 2.0E-07 | 10/00 | 6.5E+03 | 4/99 | 6.5E+03 | 10/00 | 1 |
| 2,3,4,7,8-PENTACHLORODIBENZOFURAN | 57117-31-4 | | | 8.0E-05 | 2/00 | 2.0E-08 | 10/00 | 6.5E+04 | 4/99 | 6.5E+04 | 10/00 | 1 |
| 1,2,3,4,7,8-HEXACHLORODIBENZOFURAN | 70648-26-9 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| 1,2,3,6,7,8-HEXACHLORODIBENZOFURAN | 57117-44-9 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,7,8,9-HEXACHLORODIBENZOFURAN | 72918-21-9 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 2,3,4,6,7,8-HEXACHLORODIBENZOFURAN | 60851-34-5 | | | 4.0E-04 | 2/00 | 1.0E-07 | 10/00 | 1.3E+04 | 4/99 | 1.3E+04 | 10/00 | 1 |
| 1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN | 67562-39-4 | | | 4.0E-03 | 2/00 | 1.0E-06 | 10/00 | 1.3E+03 | 4/99 | 1.3E+03 | 10/00 | 1 |
| 1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN | 55673-89-7 | | | 4.0E-03 | 2/00 | 1.0E-06 | 10/00 | 1.3E+03 | 4/99 | 1.3E+03 | 10/00 | 1 |
| 1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN | 39001-02-0 | | | 4.0E-02 | 2/00 | 1.0E-05 | 10/00 | 1.3E+01 | 4/99 | 1.3E+01 | 10/00 | 1 |
| POLYCYCLIC AROMATIC HYDROCARBON (PAH) | 1150<br>1151 | | | | | | | | | | | |
| BENZ(A)ANTHRACENE❖ | 56-55-3 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| BENZO(A)PYRENE❖ | 50-32-8 | | | | | | | 3.9E+00 | 4/99 [4/94] | 1.2E+01 | 10/00 [4/94] | 1 |
| BENZO(B)FLUORANTHENE❖ | 205-99-2 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| BENZO(J)FLUORANTHENE❖ | 205-82-3 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| BENZO(K)FLUORANTHENE❖ | 207-08-9 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| CHRYSENE❖ | 218-01-9 | | | | | | | 3.9E-02 | 4/99 [4/94] | 1.2E-01 | 10/00 [4/94] | 1 |
| DIBENZ(A,H)ACRIDINE❖ | 226-36-8 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| DIBENZ(A,H)ANTHRACENE❖ | 53-70-3 | | | | | | | 4.1E+00 | 4/99 [4/94] | 4.1E+00 | 10/00 [4/94] | 1 |
| DIBENZ(A,J)ACRIDINE❖ | 224-42-0 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| DIBENZO(A,E)PYRENE❖ | 192-65-4 | | | | | | | 3.9E+00 | 4/99 [4/94] | 1.2E+01 | 10/00 [4/94] | 1 |
| DIBENZO(A,H)PYRENE❖ | 189-64-0 | | | | | | | 3.9E+01 | 4/99 [4/94] | 1.2E+02 | 10/00 [4/94] | 1 |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ◉**

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| DIBENZO(A,I)PYRENE ❖ | 189-55-9 | | | | | | | 3.9E+01 | 4/99 [4/94] | 1.2E+02 | 10/00 [4/94] | 1 |
| DIBENZO(A,L)PYRENE ❖ | 191-30-0 | | | | | | | 3.9E+01 | 4/99 [4/94] | 1.2E+02 | 10/00 [4/94] | 1 |
| 7H-DIBENZO(C,G)CARBAZOLE ❖ | 194-59-2 | | | | | | | 3.9E+00 | 4/99 [4/94] | 1.2E+01 | 10/00 [4/94] | 1 |
| 7,12-DIMETHYLBENZ(A)ANTHRACENE ❖ | 57-97-6 | | | | | | | 2.5E+02 | 4/99 [4/94] | 2.5E+02 | 10/00 [4/94] | 1 |
| 1,6-DINITROPYRENE ❖ | 42397-64-8 | | | | | | | 3.9E+01 | 4/99 [4/94] | 1.2E+02 | 10/00 [4/94] | 1 |
| 1,8-DINITROPYRENE ❖ | 42397-65-9 | | | | | | | 3.9E+00 | 4/99 [4/94] | 1.2E+01 | 10/00 [4/94] | 1 |
| INDENO(1,2,3-C,D)PYRENE ❖ | 193-39-5 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| 3-METHYLCHOLANTHRENE ❖ | 56-49-5 | | | | | | | 2.2E+01 | 4/99 [4/94] | 2.2E+01 | 10/00 [4/94] | 1 |
| 5-METHYLCHRYSENE ❖ | 3697-24-3 | | | | | | | 3.9E+00 | 4/99 [4/94] | 1.2E+01 | 10/00 [4/94] | 1 |
| NAPHTHALENE | 91-20-3 | | | 9.0E+00 | 4/00 | | | | | | | -- |
| 5-NITROACENAPHTHENE ❖ | 602-87-9 | | | | | | | 1.3E-01 | 4/99 [4/94] | 1.3E-01 | 10/00 [4/94] | 1 |
| 6-NITROCHRYSENE ❖ | 7496-02-8 | | | | | | | 3.9E+01 | 4/99 [4/94] | 1.2E+02 | 10/00 [4/94] | 1 |
| 2-NITROFLUORENE ❖ | 607-57-8 | | | | | | | 3.9E-02 | 4/99 [4/94] | 1.2E-01 | 10/00 [4/94] | 1 |
| 1-NITROPYRENE ❖ | 5522-43-0 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| 4-NITROPYRENE ❖ | 57835-92-4 | | | | | | | 3.9E-01 | 4/99 [4/94] | 1.2E+00 | 10/00 [4/94] | 1 |
| POTASSIUM BROMATE.... ... (see Bromine & Compounds) | | | | | | | | | | | | |
| 1,3-PROPANE SULTONE | 1120-71-4 | | | | | | | 2.4E+00 | 4/99 | | | 1 |
| PROPYLENE (PROPENE) | 115-07-1 | | | 3.0E+03 | 4/00 | | | | | | | -- |
| PROPYLENE GLYCOL MONOMETHYL ETHER | 107-98-2 | | | 7.0E+03 | 2/00 | | | | | | | -- |
| PROPYLENE OXIDE | 75-56-9 | 3.1E+03 | 4/99 | 3.0E+01 | 2/00 | | | 1.3E-02 | 4/99 [7/90] | | | 1 |
| SELENIUM AND COMPOUNDS | 7782-49-2 [1170] | | | 2.0E+01 | 12/01 | | | | | | | -- |
| HYDROGEN SELENIDE | 7783-07-5 | 5.0E+00 | 4/99 | | | | | | | | | -- |
| *Selenium sulfide* | *7446-34-6* | | | *2.0E+01* | *12/01* | | | | | | | -- |
| SODIUM HYDROXIDE | 1310-73-2 | 8.0E+00 | 4/99 | 4.8E+00 | 7/90 | | | | | | | -- |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS**

| Substance | Chemical Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date Value Reviewed [Added] | MWAF |
| STYRENE | 100-42-5 | 2.1E+04 | 4/99 | 9.0E+02 | 4/00 | | | | | | | -- |
| SULFATES | 9960 | 1.2E+02 | 4/99 | 2.5E+01 | 1/92 | | | | | | | -- |
| SULFUR DIOXIDE | 7446-09-5 | 6.6E+02 | 4/99[1/92] | 6.6E+02 | 1/92 | | | | | | | -- |
| SULFURIC ACID AND OLEUM | 7664-93-9 | 1.2E+02 | 4/99 | *1.0E+00* | *12/01* | | | | | | | -- |
| *SULFURIC ACID* | *7664-93-9* | *1.2E+02* | *4/99* | 1.0E+00 | 12/01 | | | | | | | -- |
| *SULFUR TRIOXIDE* | *7446-71-9* | *1.2E+02* | *4/99* | | | | | | | | | -- |
| *OLEUM* | *8014-95-7* | *1.2E+02* | *4/99* | *1.0E+00* | *12/01* | | | | | | | -- |
| 1,1,2,2-TETRACHLOROETHANE | 79-34-5 | | | | | | | 2.0E-01 | 4/99 | | | 1 |
| TETRACHLOROPHENOLS ... (see Chlorophenols) | | | | | | | | | | | | |
| 2,4,5-TRICHLOROPHENOL ... (see Chlorophenols) | | | | | | | | | | | | |
| 2,4,6-TRICHLOROPHENOL ... (see Chlorophenols) | | | | | | | | | | | | |
| THIOACETAMIDE | 62-55-5 | | | | | | | 6.1E+00 | 4/99 | | | 1 |
| TOLUENE | 108-88-3 | 3.7E+04 | 4/99 | 3.0E+02 | 4/00 | | | | | | | -- |
| *Toluene diisocyantates* | *26471-62-5 1204* | | | *7.0E-02* | *1/01* | | | *3.9E-02* | *4/99* | | | *1* |
| TOLUENE-2,4-DIISOCYANATE | 584-84-9 | | | 7.0E-02 | 1/01 | | | 3.9E-02 | 4/99 | | | 1 |
| TOLUENE-2,6-DIISOCYANATE | 91-08-7 | | | 7.0E-02 | 1/01 | | | 3.9E-02 | 4/99 | | | 1 |
| 1,1,2-TRICHLOROETHANE (Vinyl trichloride) | 79-00-5 | | | | | | | 5.7E-02 | 4/99 | | | 1 |
| TRICHLOROETHYLENE[TAC] | 79-01-6 | | | 6.0E+02 | 4/00 | | | 7.0E-03 TAC | 10/90 | | | 1 |
| TRIETHYLAMINE | 121-44-8 | 2.8E+03 | 4/99 | $2.0^{E}$+02 | 9/02 | | | | | | | -- |
| URETHANE (Ethyl carbamate) | 51-79-6 | | | | | | | 1.0E+00 | 4/99 [7/90] | | | 1 |
| *Vanadium Compounds* | *N/A* | | | | | | | | | | | |
| *Vanadium (fume or dust)* | *7440-62-2* | *3.0E+01* | *4/99* | | | | | | | | | -- |
| VANADIUM PENTOXIDE | 1314-62-1 | 3.0E+01 | 4/99 | | | | | | | | | -- |
| VINYL ACETATE | 108-05-4 | | | 2.0E+02 | 12/01 | | | | | | | -- |
| VINYL CHLORIDE[TAC] (Chloroethylene) | 75-01-4 | 1.8E+05 | 4/99 | | | | | 2.7E-01 TAC | 12/90 | | | 1 |
| VINYLIDENE CHLORIDE (1,1-Dichloroethylene) | 75-35-4 | | | 7.0E+01 | 1/01 | | | | | | | -- |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ⊛**

| Substance ⊛ | Chemical▼ Abstract Service Number (CAS) | Noncancer Effects | | | | | | Cancer Risk | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Acute Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Inhalation REL ($\mu g/m^3$) | Date ◆ Value Reviewed [Added] | Chronic Oral REL (mg/kg/d) | Date ◆ Value Reviewed [Added] | Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | Oral Slope Factor $(mg/kg\text{-}d)^{-1}$ | Date ◆ Value Reviewed [Added] | M♣ W A F |
| XYLENES (mixed isomers) | 1330-20-7 1210 | 2.2E+04 | 4/99 | 7.0E+02 | 4/00 | | | | | | | -- |
| m-XYLENE | 108-38-3 | 2.2E+04 | 4/99 | 7.0E+02 | 4/00 | | | | | | | -- |
| o-XYLENE | 95-47-6 | 2.2E+04 | 4/99 | 7.0E+02 | 4/00 | | | | | | | -- |
| p-XYLENE | 106-42-3 | 2.2E+04 | 4/99 | 7.0E+02 | 4/00 | | | | | | | -- |

## APPENDIX L - TABLE 1
## OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS ❁

| | |
|---|---|
| Purpose: | The purpose of this reference table is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics Hot Spots Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993.* The OEHHA has adopted five technical support documents for these guidelines.<br><br>This table lists the OEHHA adopted inhalation and oral cancer slope factors, noncancer acute Reference Exposure Levels (RELs), and inhalation and oral noncancer chronic RELs. In addition, it lists the substances in Appendix A-I *(Substances For Which Emissions Must Be Quantified)* and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG)*. OEHHA is still in the process of adopting new noncancer chronic RELs. Therefore, new health values will periodically be added to, or deleted from, this table. Users of this table are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values. |
| ❁ | Substances written in *italics* do not have explicit OEHHA approved health values, but are included in this table to clarify applicability of OEHHA adopted heath effects values to individual or grouped substances listed in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances For Which Emissions Must Be Quantified".* |
| ▼ | Chemical Abstract Service Number (CAS): For chemical groupings and mixtures where a CAS number is not applicable, the 4-digit code used in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) Report* is listed. The 4-digit codes enclosed in brackets [ ] are codes that have been phased out, but may still appear on previously reported Hot Spots emissions. For information on the origin and use of the 4-digit code, see the EICG report. |
| ◆ | Date Value Reviewed [Added]: These columns list the date that the health value was last reviewed by OEHHA and the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics Hot Spots Program. If the health value is unchanged since it was first approved for use in the Hot Spots Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].<br><br>• April 1999 is listed for the cancer potency values and noncancer acute RELs, which have been adopted by the OEHHA as part of the AB 2588 "Hot Spot" Risk Assessment Guidelines.<br>• February 2000, April 2000, January 2001, and December 2001 are listed for the first set of 22, the second set of 16, the third set of 22, and the fourth set of 12 noncancer chronic RELs, respectively.<br>• October 2000 is listed for the oral chronic RELs and oral cancer slope factors. 1996 is listed for the U.S. EPA Reference Concentrations. Dates of 1990-1992 and 1996 are listed for CAPCOA chronic RELs, which may eventually be dropped or replaced.<br>• For the substances identified as Toxic Air Contaminants, the Air Resources Board hearing date is listed. The dates for acetaldehyde, benzo[a]pyrene, and methyl tertiary-butyl ether represent the dates the values were approved by the Scientific Review Panel. |
| ♣ | Molecular Weight Adjustment Factor: Molecular weight adjustment factors (MWAF) are only to be used when a toxic metal has a cancer potency factor. For most of the Hot Spots toxic metals, the OEHHA cancer potency factor applies to the weight of the toxic metal atom contained in the overall compound. Some of the Hot Spots compounds contain various elements along with the toxic metal atom (e.g., "Nickel hydroxide", CAS number 12054-48-7, has a formula of $H_2NiO_2$). Therefore, an adjustment to the reported pounds of the overall compound is needed before applying the OEHHA cancer potency factor for "Nickel and compounds" to such a compound. This ensures that the cancer potency factor is applied only to the fraction of the overall weight of the emissions that are associated with health effects of the metal. In other cases, the Hot Spots metals are already reported as the metal atom equivalent (e.g., CAS 7440-02-0, "Nickel"), and these cases do not use any further molecular weight adjustment. (Refer to Note [7] in Appendix A, List of Substances in the EICG Report for further information on how the emissions of various Hot Spots metal compounds are reported.) The appropriate molecular weight adjustment factors (MWAF) to be used along with the OEHHA cancer potency factors for Hot Spots metals can be found in the MWAF column of this table. A double dash (--) was entered into the column if the substance does not currently have a cancer potency factor.<br><br>So, for example, assume 100 pounds of "Nickel hydroxide" emissions are reported under CAS number 12054-48-7. To get the Nickel atom equivalent of these emissions, multiply by the listed MWAF (0.6332) for Nickel hydroxide:<br><br>• 100 pounds x 0.6332 = 63.32 pounds of Nickel atom equivalent<br><br>*This step should be completed prior to applying the OEHHA cancer potency factor for "Nickel and compounds" in a calculation for a prioritization score or risk assessment calculation.* (For more information see Chapter 4 and Appendix H of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments.*)<br><br>Note: The value listed in the MWAF column for Asbestos is not a molecular weight adjustment. This is a conversion factor for adjusting mass to fibers or structures. See Appendix C of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for more information on Asbestos, or see the EICG report for reporting guidance. Also see the Asbestos footnote (designated by the symbol ⌑) |
| N/A | Not Applicable |
| *Ñ* | Values calculated using WHO TEF procedure in OEHHA, 2003 |
| TAC | Toxic Air Contaminant: The Air Resources Board has identified this substance as a Toxic Air Contaminant. |

**APPENDIX L - TABLE 1**
**OEHHA/ARB APPROVED HEALTH VALUES FOR USE IN HOT SPOT FACILITY RISK ASSESSMENTS** ❁

| | |
|---|---|
| AveP | The averaging period of noncancer acute RELs is generally a one-hour exposure. However, some are based on several hour exposure for reproductive/developmental endpoints (see section 1.6 of OEHHA's technical support document for *The Determination of Acute Reference Exposure Levels for Airborne Toxicants, March 1999*). Typically the RELs for the following substances are compared to modeled emission concentrations of the same duration rather than maximum one-hour concentrations (e.g., a 4-hour REL should be compared to the maximum 4-hour average concentration from the air dispersion model).<br>4-Hour: Arsenic and Inorganic Arsenic Compounds<br>6-Hour: Benzene, Carbon disulfide, Ethylene glycol monoethyl ether, Ethylene glycol monoethyl ether acetate, Ethylene glycol monomethyl ether<br>7-Hour: Carbon tetrachloride, Chloroform |
| ¤ | Asbestos: The units for the Inhalation Cancer Potency factor for asbestos are $(100 \text{ PCM fibers/m}^3)^{-1}$. A conversion factor of 100 fibers/0.003 µg can be multiplied by a receptor concentration of asbestos expressed in $\mu g/m^3$. Unless other information necessary to estimate the concentration ($\text{fibers/m}^3$) of asbestos at receptors of interest is available. A unit risk factor of $2.7E\ 10^{-6}$ $(\mu g/m^3)^{-1}$ and an inhalation cancer potency factor of $2.2E\ 10^{+2}$ $(\text{mg/kg BW} * \text{day})^{-1}$ are available. For more information on asbestos quantity conversion factors, see Appendix C of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part II; Technical Support Document for Describing Available Cancer Potency Factors*, and Appendix C of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments*. |
| ✳ | Inorganic Lead: Inorganic Lead was identified by the Air Resources Board as a Toxic Air Contaminant in April 1997. Since information on noncancer health effects show no identified threshold, no Reference Exposure Level has been developed. The document, *Risk Management Guidelines for New, Modified, and Existing Sources of Lead, March 2001*, has been developed by ARB and OEHHA staff for assessing noncancer health impacts from sources of lead. See Appendix F of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for an overview of how to evaluate noncancer impacts from exposure to lead using these risk management guidelines. |
| ❖ | Polycyclic Aromatic Hydrocarbons (PAHs): These substances are PAH or PAH-derivatives that have OEHHA-developed Potency Equivalency Factors (PEFs) which were approved by the Scientific Review Panel in April 1994 (see ARB document entitled *Benzo [a]pyrene as a Toxic Air Contaminant*). PAH inhalation slope factors listed here have been adjusted by the PEFs. See Appendix G of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for more information. |
| ★ | Polychlorinated Biphenyls: (unspeciated mixtures)<br>Lowest Risk: For use in cases where congeners with more than four chlorines comprise less than one-half percent of total polychlorinated biphenyls.<br>High Risk: For use in cases where congeners with more than four chlorines do not comprise less than one-half percent of total polychlorinated biphenyls.<br>The Low Risk: This number would not ordinarly be used in the Hot Spots program. |
| • | Polychlorinated Dibenzo-*p*-dioxins and Polychlorinated Dibenzofurans (also referred to as chlorinated dioxins and dibenzofurans): The OEHHA has adopted the World Health Organization 1997 ($\text{WHO}_{97}$) Toxicity Equivalency Factor ) scheme for evaluating the cancer and noncancer risk due to exposure to samples containing speciated mixtures of polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). See Appendix A of OEHHA's *Technical Support Document For Describing Available Cancer Potency Factors* for more information about the scheme. See Appendix E of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for the methodology for calculating 2,3,7,8-equivalents for PCDD and PCDFs. |
| ■ | Particulate Emissions from Diesel-Fueled Engines: The inhalation cancer potency factor and chronic REL were derived from whole diesel exhaust and should be used only for impacts from the inhalation pathway. The inhalation impacts from speciated emissions from diesel-fueled engines are already accounted for in the inhalation cancer potency factor and REL. However, at the discretion of the risk assessor, speciated emissions from diesel-fueled engines may be used to estimate acute noncancer health impacts or the contribution to cancer risk or chronic noncancer health impacts for the non-inhalation exposure pathway. See Appendix D of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for more information. |

Table last updated: August, 2003

## APPENDIX L - TABLE 2 OEHHA/ARB ACUTE REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| Substance ❁ | Chemical▼ Abstract Service Number (CAS) | Acute REL ($\mu g/m^3$) | Date ◆ Value Reviewed | Target Organs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alimentary Tract | Cardiovascular | Developmental | Eye | Hematologic | Immune | Nervous | Reproductive | Respiratory | Skin |
| ACROLEIN | 107-02-8 | 1.9E-01 | 4/99 | | | | X | | | | | X | |
| ACRYLIC ACID | 79-10-7 | 6.0E+03 | 4/99 | | | | X | | | | | X | |
| AMMONIA | 7664-41-7 | 3.2E+03 | 4/99 | | | | X | | | | | X | |
| ARSENIC AND COMPOUNDS (INORGANIC) TAC | 7440-38-2 1016 [1015] | 1.9E-01 AveP | 4/99 | | | X | | | | | X | | |
| ARSINE | 7784-42-1 | 1.6E+02 | 4/99 | | | | | X | | | | | |
| BENZENE TAC | 71-43-2 | 1.3E+03 AveP | 4/99 | | | X | | X | X | | X | | |
| BENZYL CHLORIDE | 100-44-7 | 2.4E+02 | 4/99 | | | | X | | | | | X | |
| CARBON DISULFIDE | 75-15-0 | 6.2E+03 AveP | 4/99 | | | X | | | | X | X | | |
| CARBON MONOXIDE | 630-08-0 | 2.3E+04 | 4/99 | | X | | | | | | | | |
| CARBON TETRACHLORIDE TAC (Tetrachloromethane) | 56-23-5 | 1.9E+03 AveP | 4/99 | X | | X | | | | X | X | | |
| CHLORINE | 7782-50-5 | 2.1E+02 | 4/99 | | | | X | | | | | X | |
| CHLOROFORM TAC | 67-66-3 | 1.5E+02 AveP | 4/99 | | | X | | | | X | X | | |
| CHLOROPICRIN | 76-06-2 | 2.9E+01 | 4/99 | | | | X | | | | | X | |
| COPPER AND COMPOUNDS | 7440-50-8 [1067] | 1.0E+02 | 4/99 | | | | | | | | | X | |
| *Cyanide Compounds (inorganic)* | *57-12-5 1073* | *3.4E+02* | *4/99* | | | | | | | ✓ | | | |
| HYDROGEN CYANIDE (Hydrocyanic acid) | 74-90-8 | 3.4E+02 | 4/99 | | | | | | | X | | | |
| 1,4-DIOXANE ✣ (1,4-Diethylene dioxide) | 123-91-1 | 3.0E+03 | 4/99 | | | | X | | | | | X | |
| EPICHLOROHYDRIN (1-Chloro-2,3-epoxypropane) | 106-89-8 | 1.3E+03 | 4/99 | | | | X | | | | | X | |
| *Fluorides and Compounds* | *1101* | *2.4E+02* | *4/99* | | | | ✓ | | | | | ✓ | |
| HYDROGEN FLUORIDE (Hydrofluoric acid) | 7664-39-3 | 2.4E+02 | 4/99 | | | | X | | | | | X | |
| FORMALDEHYDE TAC | 50-00-0 | 9.4E+01 | 4/99 | | | | X | | X | | | X | |
| GLYCOL ETHERS | 1115 | | | | | | | | | | | | |
| ETHYLENE GLYCOL BUTYL ETHER – EGBE | 111-76-2 | 1.4E+04 | 4/99 | | | | X | | | | | X | |
| ETHYLENE GLYCOL ETHYL ETHER – EGEE | 110-80-5 | 3.7E+02 AveP | 4/99 [1/92] | | | X | | | | | X | | |
| ETHYLENE GLYCOL ETHYL ETHER ACETATE - EGEEA | 111-15-9 | 1.4E+02 AveP | 4/99 | | | X | | | | X | X | | |
| ETHYLENE GLYCOL METHYL ETHER – EGME | 109-86-4 | 9.3E+01 AveP | 4/99 | | | X | | | | | X | | |

## APPENDIX L - TABLE 2 OEHHA/ARB ACUTE REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Acute REL ($\mu g/m^3$) | Date ◆ Value Reviewed | Target Organs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alimentary Tract | Cardiovascular | Developmental | Eye | Hematologic | Immune | Nervous | Reproductive | Respiratory | Skin |
| HYDROCHLORIC ACID (Hydrogen chloride) | 7647-01-0 | 2.1E+03 | 4/99 | | | | X | | | | | X | |
| HYDROGEN CYANIDE (Hydrocyanic acid) ... (see Cyanide Compounds) | | | | | | | | | | | | | |
| HYDROGEN FLUORIDE (Hydrofluoric acid) ... (see Fluorides & Compounds) | | | | | | | | | | | | | |
| HYDROGEN SELENIDE ... (see Selenium & Compounds) | | | | | | | | | | | | | |
| HYDROGEN SULFIDE | 7783-06-4 | 4.2E+01 | 4/99 [7/90] | | | | | | | X | | | |
| ISOPROPYL ALCOHOL (Isopropanol) | 67-63-0 | 3.2E+03 | 4/99 | | | | X | | | | | X | |
| MERCURY AND COMPOUNDS (INORGANIC) | 7439-97-6 [1133] | 1.8E+00 | 4/99 | | | X | | | | | X | | |
| *Mercuric chloride* | *7487-94-7* | *1.8E+00* | *4/99* | | | ✓ | | | | | ✓ | | |
| METHANOL | 67-56-1 | 2.8E+04 | 4/99 | | | | | | | X | | | |
| METHYL BROMIDE (Bromomethane) | 74-83-9 | 3.9E+03 | 4/99 | | | X | | | | X | X | X | |
| METHYL CHLOROFORM (1,1,1-Trichloroethane) | 71-55-6 | 6.8E+04 | 4/99 | | | | | | | X | | | |
| METHYL ETHYL KETONE (2-Butanone) | 78-93-3 | 1.3E+04 | 4/99 | | | | X | | | | | X | |
| METHYLENE CHLORIDE[TAC] (Dichloromethane) | 75-09-2 | 1.4E+04 | 4/99 | | | | | | | X | | | |
| NICKEL AND COMPOUNDS[TAC] | 7440-02-0 [1145] | 6.0E+00 | 4/99 | | | | | | X | | | X | |
| *Nickel acetate,* | *373-02-4* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| *Nickel carbonate* | *3333-39-3* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| *Nickel carbonyl* | *13463-39-3* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| *Nickel hydroxide* | *12054-48-7* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| *Nickelocene* | *1271-28-9* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| NICKEL OXIDE | 1313-99-1 | 6.0E+00 | 4/99 | | | | | | X | | | X | |
| *Nickel refinery dust from the pyrometallurgical process* | *1146* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| *Nickel subsulfide* | *12035-72-2* | *6.0E+00* | *4/99* | | | | | | ✓ | | | ✓ | |
| NITRIC ACID | 7697-37-2 | 8.6E+01 | 4/99 | | | | | | | | | X | |
| NITROGEN DIOXIDE | 10102-44-0 | 4.7E+02 | 4/99 [1/92] | | | | | | | | | X | |
| OZONE | 10028-15-6 | 1.8E+02 | 4/99 [1/92] | | | | X | | | | | X | |
| PERCHLOROETHYLENE[TAC] (Tetrachloroethylene) | 127-18-4 | 2.0E+04 | 4/99 | | | | X | | | X | | X | |
| PHENOL | 108-95-2 | 5.8E+03 | 4/99 | | | | X | | | | | X | |

## APPENDIX L - TABLE 2 OEHHA/ARB ACUTE REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| Substance ❁ | Chemical▼ Abstract Service Number (CAS) | Acute REL ($\mu g/m^3$) | Date ◆ Value Reviewed | Target Organs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Alimentary Tract | Cardiovascular | Developmental | Eye | Hematologic | Immune | Nervous | Reproductive | Respiratory | Skin |
| PHOSGENE | 75-44-5 | 4.0E+00 | 4/99 | | | | | | | | | X | |
| PROPYLENE OXIDE | 75-56-9 | 3.1E+03 | 4/99 | | | X | X | | | | X | X | |
| *Selenium and Compounds* | *7782-49-2 [1170]* | | | | | | | | | | | | |
| HYDROGEN SELENIDE | 7783-07-5 | 5.0E+00 | 4/99 | | | | X | | | | | X | |
| SODIUM HYDROXIDE | 1310-73-2 | 8.0E+00 | 4/99 | | | | X | | | | | X | X |
| STYRENE | 100-42-5 | 2.1E+04 | 4/99 | | | | X | | | | | X | |
| SULFATES | 9960 | 1.2E+02 | 4/99 | | | | | | | | | X | |
| SULFUR DIOXIDE | 7446-09-5 | 6.6E+02 | 4/99 [1/92] | | | | | | | | | X | |
| SULFURIC ACID AND OLEUM | 7664-93-9 | 1.2E+02 | 4/99 | | | | | | | | | X | |
| *SULFURIC ACID* | *7664-93-9* | *1.2E+02* | *4/99* | | | | | | | | | ✓ | |
| *SULFUR TRIOXIDE* | *7446-71-9* | *1.2E+02* | *4/99* | | | | | | | | | ✓ | |
| *OLEUM* | *8014-95-7* | *1.2E+02* | *4/99* | | | | | | | | | ✓ | |
| TOLUENE | 108-88-3 | 3.7E+04 | 4/99 | | | X | X | | | X | X | X | |
| TRIETHYLAMINE | 121-44-8 | 2.8E+03 | 4/99 | | | | X | | | X | | | |
| *Vanadium Compounds* | *N/A* | | | | | | | | | | | | |
| *Vanadium (fume or dust)* | *7440-62-2* | *3.0E+01* | *4/99* | | | | ✓ | | | | | ✓ | |
| VANADIUM PENTOXIDE | 1314-62-1 | 3.0E+01 | 4/99 | | | | X | | | | | X | |
| VINYL CHLORIDE[TAC] (Chloroethylene) | 75-01-4 | 1.8E+05 | 4/99 | | | | X | | | X | | X | |
| XYLENES (mixed isomers) | 1330-20-7 1210 | 2.2E+04 | 4/99 | | | | X | | | | | X | |
| m-Xylene | 108-38-3 | 2.2E+04 | 4/99 | | | | X | | | | | X | |
| o-Xylene | 95-47-6 | 2.2E+04 | 4/99 | | | | X | | | | | X | |
| p-Xylene | 106-42-3 | 2.2E+04 | 4/99 | | | | X | | | | | X | |

## APPENDIX L - TABLE 2 OEHHA/ARB ACUTE REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| | |
|---|---|
| Purpose: | The purpose of this reference table is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics Hot Spots Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993*. The OEHHA has adopted five technical support documents for these guidelines.<br>This table lists the OEHHA adopted noncancer acute Reference Exposure Levels (RELs). In addition, it lists the substances in Appendix A-I *(Substances For Which Emissions Must Be Quantified*) and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG)*. Users of this table are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values. |
| ❁ | Substances written in *italics* and with a ✓ do not have explicit OEHHA approved health values, but are included in this table to clarify applicability of OEHHA adopted health effects values to individual or grouped substances listed in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances For Which Emissions Must Be Quantified"*. |
| ▼ | Chemical Abstract Service Number (CAS): For chemical groupings and mixtures where a CAS number is not applicable, the 4-digit code used in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) Report* is listed. The 4-digit codes enclosed in brackets [ ] are codes that have been phased out, but may still appear on previously reported Hot Spots emissions. For information on the origin and use of the 4-digit code, see the EICG report. |
| ◆ | Date Value Reviewed [Added]: This column lists the date that the health value was last reviewed by OEHHA and the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics "Hot Spots" Program. If the health value is unchanged since it was first approved for use in the "Hot Spots" Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].<br>• April 1999 is listed for the noncancer acute RELs which have been adopted by the OEHHA as part of the AB 2588 "Hot Spot" Risk Assessment Guidelines. |
| TAC | Toxic Air Contaminant: The Air Resources Board has identified this substance as a Toxic Air Contaminant. |
| AveP | The averaging period of noncancer acute RELs is generally a one-hour exposure. However, some are based on several hour exposure for reproductive/developmental endpoints (see section 1.6 of OEHHA's technical support document for *The Determination of Acute Reference Exposure Levels for Airborne Toxicants, March 1999).* Typically the RELs for the following substances are compared to modeled emission concentrations of the same duration rather than maximum one-hour concentrations (e.g., a 4-hour REL should be compared to the maximum 4-hour average concentration from the air dispersion model).<br>4-Hour: Arsenic and Inorganic Arsenic Compounds<br>6-Hour: Benzene, Carbon disulfide, Ethylene glycol ethyl ether, Ethylene glycol ethyl ether acetate, Ethylene glycol methyl ether<br>7-Hour: Carbon tetrachloride, Chloroform |

Table last updated: August 2003

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL (µg/m$^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| ACETALDEHYDE | 75-07-0 | 9.0E+00 | | 5/93 | | | | | | | | | | | | X | |
| ACROLEIN | 107-02-8 | 6.0E-02 | | 1/01 | | | | | | X | | | | | | X | |
| ACRYLONITRILE | 107-13-1 | 5.0E+00 | | 12/01 | | | | | | | | | | | | X | |
| AMMONIA | 7664-41-7 | 2.0E+02 | | 2/00 | | | | | | | | | | | | X | |
| ARSENIC AND COMPOUNDS (INORGANIC) TAC | 7440-38-2 1016 [1015] | 3.0E-02 | | 1/01 | | | X | X | | | | | | X | | | |
| | | | 3.0$^E$-04 | 10/00 | | | X | | | | | | | | | | X |
| BENZENE TAC | 71-43-2 | 6.0E+01 | | 2/00 | | | | X | | | X | | | X | | | |
| BERYLLIUM AND COMPOUNDS | 7440-41-7 [1021] | 7.0E-03 | | 12/01 | | | | | | | | X | | | | X | |
| | | | 2.0$^E$-03 | 12/01 | X | | | | | | | | | | | | |
| 1,3-BUTADIENE TAC | 106-99-0 | 2.0E+01 | | 1/01 | | | | | | | | | | | X | | |
| CADMIUM AND COMPOUNDS T7AC | 7440-43-9 [1045] | 2.0E-02 | | 1/01 | | | | | | | | | X | | | X | |
| | | | 5.0$^E$-04 | 10/00 | | | | | | | | | X | | | | |
| CARBON DISULFIDE | 75-15-0 | 8.0E+02 | | 11/01 | | | | | | | | | | X | X | | |
| CARBON TETRACHLORIDE TAC (Tetrachloromethane) | 56-23-5 | 4.0E+01 | | 1/01 | X | | | X | | | | | | X | | | |
| CHLORINE | 7782-50-5 | 2.0E-01 | | 2/00 | | | | | | | | | | | | X | |
| CHLORINE DIOXIDE | 10049-04-4 | 6.0E-01 | | 1/01 | | | | | | | | | | | | X | |
| CHLOROBENZENE | 108-90-7 | 1.0E+03 | | 1/01 | X | | | | | | | | X | | X | | |
| CHLOROFORM TAC | 67-66-3 | 3.0E+02 | | 4/00 | X | | | X | | | | | X | | | | |
| CHLOROPICRIN | 76-06-2 | 4.0E-01 | | 12/01 | | | | | | | | | | | | X | |
| CHROMIUM 6+ TAC | 18540-29-9 | 2.0E-01 | | 1/01 | | | | | | | | | | | | X | |
| | | | 2.0E-02 | 10/00 | | | | | | | X | | | | | | |
| *Barium chromate* | *10294-40-3* | *2.0E-01* | | *1/01* | | | | | | | | | | | | ✓ | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |
| *Calcium chromate* | *13765-19-0* | *2.0E-01* | | *1/01* | | | | | | | | | | | | ✓ | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |
| *Lead chromate* | *7758-97-6* | *2.0E-01* | | *1/01* | | | | | | | | | | | | ✓ | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| Substance ❁ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| *Sodium dichromate* | *10588-01-9* | *2.0E-01* | | *1/01* | | | | | | | | | | | | ✓ | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |
| *Strontium chromate* | *7789-06-2* | *2.0E-01* | | *1/01* | | | | | | | | | | | | ✓ | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |
| CHROMIUM TRIOXIDE (as chromic acid mist) | 1333-82-0 | 2.0E-03 | | 1/01 | | | | | | | | | | | | **X** | |
| | | | *2.0E-02* | *10/00* | | | | | | | ✓ | | | | | | |
| CRESOLS (mixtures of) | 1319-77-3 | 6.0E+02 | | 1/01 | | | | | | | | | | **X** | | | |
| m-CRESOL | 108-39-4 | 6.0E+02 | | 1/01 | | | | | | | | | | **X** | | | |
| o-CRESOL | 95-48-7 | 6.0E+02 | | 1/01 | | | | | | | | | | **X** | | | |
| p-CRESOL | 106-44-5 | 6.0E+02 | | 1/01 | | | | | | | | | | **X** | | | |
| *Cyanide Compounds (inorganic)* | *57-12-5 1073* | *9.0E+00* | | *4/00* | | | ✓ | | ✓ | | | | | ✓ | | | |
| HYDROGEN CYANIDE (Hydrocyanic acid) | 74-90-8 | 9.0E+00 | | 4/00 | | | **X** | | **X** | | | | | **X** | | | |
| p-DICHLOROBENZENE | 106-46-7 | 8.0E+02 | | 1/01 | **X** | | | | | | | | **X** | **X** | | **X** | |
| 1,1,-DICHLOROETHYLENE … (see Vinylidene Chloride) | | | | | | | | | | | | | | | | | |
| DIESEL EXHAUST … (see Particulate Emissions from Diesel-Fueled Engines) | | | | | | | | | | | | | | | | | |
| DIETHANOLAMINE | 111-42-2 | 3.0E+00 | | 12/01 | | | **X** | | | | | | | **X** | | | |
| N,N-DIMETHYL FORMAMIDE | 68-12-2 | 8.0E+01 | | 1/01 | **X** | | | | | | | | | | | **X** | |
| 1,4-DIOXANE✣ (1,4-Diethylene dioxide) | 123-91-1 | 3.0E+03 | | 4/00 | **X** | | **X** | | | | | | **X** | | | | |
| EPICHLOROHYDRIN (1-Chloro-2,3-epoxypropane) | 106-89-8 | 3.0E+00 | | 1/01 | | | | | | **X** | | | | | | **X** | |
| 1,2-EPOXYBUTANE | 106-88-7 | 2.0E+01 | | 1/01 | | | **X** | | | | | | | | | **X** | |
| ETHYL BENZENE | 100-41-4 | 2.0E+03 | | 2/00 | **X** | | | **X** | **X** | | | | **X** | | | | |
| ETHYL CHLORIDE (Chlorethane) | 75-00-3 | 3.0E+04 | | 4/00 | **X** | | | **X** | | | | | | | | | |
| ETHYLENE DIBROMIDE[TAC] (1,2-Dibromoethane) | 106-93-4 | 8.0E-01 | | 12/01 | | | | | | | | | | | **X** | | |
| ETHYLENE DICHLORIDE[TAC] (1,2-Dichloroethane) | 107-06-2 | 4.0E+02 | | 1/01 | **X** | | | | | | | | | | | | |
| ETHYLENE GLYCOL | 107-21-1 | 4.0E+02 | | 4/00 | | | | **X** | | | | | **X** | | | **X** | |
| ETHYLENE OXIDE[TAC] (1,2-Epoxyethane) | 75-21-8 | 3.0E+01 | | 1/01 | | | | | | | | | | **X** | | | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| Fluorides | 1101 | 1.3E+1 | 4.0E-2 | 8/03 | | X | | | | ✓* | | | | | | ✓ | ✓* |
| HYDROGEN FLUORIDE (Hydrofluoric acid) | 7664-39-3 | 1.4E+1 | 4.0E-2 | 8/03 | | X | | | | X* | | | | | | X | X* |
| FORMALDEHYDE TAC | 50-00-0 | 3.0E+00 | | 2/00 | | | | | | X | | | | | | X | |
| GLUTARALDEHYDE | 111-30-8 | 8.0E-02 | | 1/01 | | | | | | | | | | | | X | |
| GLYCOL ETHERS | 1115 | | | | | | | | | | | | | | | | |
| ETHYLENE GLYCOL ETHYL ETHER – EGEE | 110-80-5 | 7.0E+01 | | 2/00 | | | | | | | X | | | | X | | |
| ETHYLENE GLYCOL ETHYL ETHER ACETATE - EGEEA | 111-15-9 | 3.0E+02 | | 2/00 | | | | X | | | | | | | | | |
| ETHYLENE GLYCOL METHYL ETHER – EGME | 109-86-4 | 6.0E+01 | | 2/00 | | | | | | | | | | | X | | |
| ETHYLENE GLYCOL METHYL ETHER ACETATE – EGMEA | 110-49-6 | 9.0E+01 | | 2/00 | | | | | | | | | | | X | | |
| n-HEXANE | 110-54-3 | 7.0E+03 | | 4/00 | | | | | | | | | | X | | | |
| HYDRAZINE | 302-01-2 | 2.0E-01 | | 1/01 | X | | | | X | | | | | | | | |
| HYDROCHLORIC ACID (Hydrogen chloride) | 7647-01-0 | 9.0E+00 | | 2/00 | | | | | | | | | | | | X | |
| HYDROGEN CYANIDE (Hydrocyanic acid) (see Cyanide Compounds) | | | | | | | | | | | | | | | | | |
| HYDROGEN FLUORIDE (Hydrofluoric acid) (see Fluorides & Compounds) | | | | | | | | | | | | | | | | | |
| HYDROGEN SULFIDE | 7783-06-4 | 1.0E+01 | | 4/00 | | | | | | | | | | | | X | |
| ISOPHORONE | 78-59-1 | 2.0E+03 | | 12/01 | X | | | X | | | | | | | | | |
| ISOPROPYL ALCOHOL (Isopropanol) | 67-63-0 | 7.0E+03 | | 2/00 | | | | X | | | | | X | | | | |
| MALEIC ANHYDRIDE | 108-31-6 | 7.0E-01 | | 12/01 | | | | | | | | | | | | X | |
| MANGANESE AND COMPOUNDS | 7439-96-5 [1132] | 2.0E-01 | | 4/00 | | | | | | | | | | X | | | |
| MERCURY AND COMPOUNDS (INORGANIC) | 7439-97-6 [1133] | 9.0E-02 | | 2/00 | | | | | | | | | | X | | | |
| | | | $3.0^{E}$-04 | 10/00 [1/92] | | | | | | | | X | X | | | | |
| *Mercuric chloride* | *7487-94-7* | *9.0E-02* | | *2/00* | | | | | | | | | | ✓ | | | |
| | | | *3.0E-04* | *10/00 [1/92]* | | | | | | | | ✓ | ✓ | | | | |
| MERCURY AND COMPOUNDS (ORGANIC) | N/A | | | | | | | | | | | | | | | | |
| METHANOL | 67-56-1 | 4.0E+03 | | 4/00 | | | | X | | | | | | | | | |
| METHYL BROMIDE (Bromomethane) | 74-83-9 | 5.0E+00 | | 2/00 | | | | X | | | | | | X | | X | |
| METHYL tertiary-BUTYL ETHER | 1634-04-4 | 8.0E+03 | | 2/00 | X | | | | | X | | | X | | | | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| Substance ❁ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| METHYL CHLOROFORM (1,1,1-Trichloroethane) | 71-55-6 | 1.0E+03 | | 2/00 | | | | | | | | | | X | | | |
| METHYL ISOCYANATE | 624-83-9 | 1.0E+00 | | 12/01 | | | | | | | | | | | X | X | |
| METHYLENE CHLORIDE[TAC] (Dichloromethane) | 75-09-2 | 4.0E+02 | | 2/00 | | | X | | | | | | | X | | | |
| 4,4'-METHYLENE DIANILINE (AND ITS DICHLORIDE) | 101-77-9 | 2.0E+01 | | 12/01 | X | | | | | X | | | | | | | |
| METHYLENE DIPHENYL ISOCYANATE | 101-68-8 | 7.0E-01 | | 1/01 | | | | | | | | | | | | X | |
| NAPHTHALENE | 91-20-3 | 9.0E+00 | | 4/00 | | | | | | | | | | | | X | |
| NICKEL AND COMPOUNDS[TAC] | 7440-02-0 [1145] | 5.0E-02 | | 2/00 | | | | | | | X | | | | | X | |
| | | | 5.0E-02 | 10/00 | X | | | | | | | | | | | | |
| *Nickel acetate* | *373-02-4* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| *Nickel carbonate* | *3333-39-3* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| *Nickel carbonyl* | *13463-39-3* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| *Nickel hydroxide* | *12054-48-7* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| *Nickelocene* | *1271-28-9* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| NICKEL OXIDE | 1313-99-1 | 1.0E-01 | | 2/00 | | | | | | | X | | | | | X | |
| | | | 5.0E-02 | 10/00 | X | | | | | | | | | | | | |
| *Nickel refinery dust from pyrometallurgical process* | *1146* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| *Nickel subsulfide* | *12035-72-2* | *5.0E-02* | | *2/00* | | | | | | | ✓ | | | | | ✓ | |
| | | | *5.0E-02* | *10/00* | ✓ | | | | | | | | | | | | |
| PCB (POLYCHLORINATED BIPHENYLS (speciated)∇ | | | | | | | | | | | | | | | | | |
| 3,3',4,4'-TETRACHLOROBIPHENYL (77) | 35298-13-3 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –04 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 3,4,4',5-TETRACHLOROBIPHENYL (81) | 70362-50-4 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –04 | 8/03 | X | | | X | X | | X | | | | X | X | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| 2,3,3',4,4' - PENTACHLOROBIPHENYL (105) | 32598-14-4 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –04 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3,4,4'5 - PENTACHLOROBIPHENYL (114) | 74472-37-0 | 8.0E-02 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 2.0E –05 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3'4,4',5- PENTACHLOROBIPHENYL (118) | 31508-00-6 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –04 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2',3,4,4',5 - PENTACHLOROBIPHENYL (123) | 65510-44-3 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –04 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 3,3',4,4',5 - PENTACHLOROBIPHENYL (126) | 57465-28-8 | 4.0E-04 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –07 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3,3',4,4',5-HEXACHLOROBIPHENYL (156) | 38380-08-4 | 8.0E-02 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 2.0E –05 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3,3',4,4',5'-HEXACHLOROBIPHENYL (157) | 69782-90-7 | 8.0E-02 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 2.0E –05 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3',4,4',5,5'-HEXACHLOROBIPHENYL (167) | 52663-72-6 | 4.0E-00 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –03 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 3,3',4,4'5,5' - HEXACHLOROBIPHENYL (169) | 32774-16-6 | 4.0E-03 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E –06 | 8/03 | X | | | X | X | | X | | | | X | X | |
| 2,3,3'4,4',5,5' - HEPTACHLOROBIPHENYL (189) | 39635-31-9 | 4.0E-01 | | 8/03 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0 E-04 | 8/03 | X | | | X | X | | X | | | | X | X | |
| PARTICULATE EMISSIONS FROM DIESEL-FUELED ENGINES[TAC]■ | 9901 | 5.0E+00[TAC] | | 8/98 | | | | | | | | | | | | X | |
| PERCHLOROETHYLENE[TAC] (Tetrachloroethylene) | 127-18-4 | 3.5E+01[TAC] | | 10/91 | X | | | | | | | | X | | | | |
| PHENOL | 108-95-2 | 2.0E+02 | | 4/00 | X | | X | | | | | | X | X | | | |
| PHOSPHINE | 7803-51-2 | 8.0E-1 | | 9/02 | X | | | | | | | | | X | | X | |
| PHOSPHORIC ACID | 7664-38-2 | 7.0E+00 | | 2/00 | | | | | | | | | | | | X | |
| PHTHALIC ANHYDRIDE | 85-44-9 | 2.0E+01 | | 1/01 | | | | | | | | | | | | X | |
| POLYCHLORINATED DIBENZO-P-DIOXINS (PCDD) (AS 2,3,7,8-EQUIV)[TAC]● | 1085 1086 | | | | | | | | | | | | | | | | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ❁

| Substance ❁ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| 2,3,7,8-TETRACHLORODIBENZO-*P*-DIOXIN[TAC] | 1746-01-6 | 4.0E-05 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-08 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,7,8-PENTACHLORODIBENZO-*P*-DIOXIN | 40321-76-4 | 4.0E-05 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-08 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,7,8-HEXACHLORODIBENZO-*P*-DIOXIN | 39227-28-6 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,6,7,8-HEXACHLORODIBENZO-*P*-DIOXIN | 57653-85-7 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,7,8,9-HEXACHLORODIBENZO-*P*-DIOXIN | 19408-74-3 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,6,7,8-HEPTACHLORODIBENZO-*P*-DIOXIN | 35822-46-9 | 4.0E-03 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-06 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,6,7,8,9-OCTACHLORODIBENZO-*P*-DIOXIN | 3268-87-9 | 4.0E-01 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-04 | 10/00 | X | | | X | X | | X | | | | X | X | |
| POLYCHLORINATED DIBENZOFURANS (PCDF) (AS 2,3,7,8-EQUIV) [TAC] ● | 1080 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| 2,3,7,8-TETRACHLORODIBENZOFURAN | 5120-73-19 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,7,8-PENTACHLORODIBENZOFURAN | 57117-41-6 | 8.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 2.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 2,3,4,7,8-PENTACHLORODIBENZOFURN | 57117-31-4 | 8.0E-05 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 2.0E-08 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,7,8-HEXACHLORODIBENZOFURAN | 70648-26-9 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,6,7,8-HEXACHLORODIBENZOFURAN | 57117-44-9 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,7,8,9-HEXACHLORODIBENZOFURAN | 72918-21-9 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 2,3,4,6,7,8-HEXACHLORODIBENZOFURAN | 60851-34-5 | 4.0E-04 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-07 | 10/00 | X | | | X | X | | X | | | | X | X | |

## APPENDIX L - TABLE 3 OEHHA/ARB CHRONIC INHALATION AND ORAL REFERENCE EXPOSURE LEVELS AND TARGET ORGANS ◉

| Substance ◉ | Chemical▼ Abstract Service Number (CAS) | Chronic Inhalation REL ($\mu g/m^3$) | Chronic Oral REL | Date ◆ Value Reviewed [Added] | Target Organs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Alimentary | Bone | Cardiovascular | Developmental | Endocrine | Eye | Hematologic | Immune | Kidney | Nervous | Reproductive | Respiratory | Skin |
| 1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN | 67562-39-4 | 4.0E-03 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-06 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN | 55673-89-7 | 4.0E-03 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-06 | 10/00 | X | | | X | X | | X | | | | X | X | |
| 1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN | 39001-02-0 | 4.0E-01 | | 2/00 | X | | | X | X | | X | | | | X | X | |
| | | | 1.0E-04 | 10/00 | X | | | X | X | | X | | | | X | X | |
| PROPYLENE (PROPENE) | 115-07-1 | 3.0E+03 | | 4/00 | | | | | | | | | | | | X | |
| PROPYLENE GLYCOL MONOMETHYL ETHER | 107-98-2 | 7.0E+03 | | 2/00 | X | | | | | | | | | | | | |
| PROPYLENE OXIDE | 75-56-9 | 3.0E+01 | | 2/00 | | | | | | | | | | | | X | |
| SELENIUM AND COMPOUNDS (other than hydrogen selenide) | 7782-49-2 [1170] | 2.0E+01 | | 12/01 | X | | X | | | | | | | X | | | |
| STYRENE | 100-42-5 | 9.0E+02 | | 4/00 | | | | | | | | | | X | | | |
| SULFURIC ACID | 7664-93-9 | 1.0E+00 | | 12/01 | | | | | | | | | | | | X | |
| *Sulfuric Acid and Oleum* | *7664-93-9* | *1.0E+00* | | *12/01* | | | | | | | | | | | | ✓ | |
| *Sulfuric Trioxide* | *7446-71-9* | *1.0E+00* | | *12/01* | | | | | | | | | | | | ✓ | |
| *Oleum* | *8014-95-7* | *1.0E+00* | | *12/01* | | | | | | | | | | | | ✓ | |
| TOLUENE | 108-88-3 | 3.0E+02 | | 4/00 | | | | X | | | | | | X | | X | |
| *Toluene diisocyanates* | *26471-62-5 1204* | *7.0E-02* | | *1/01* | | | | | | | | | | | | ✓ | |
| TOLUENE-2,4-DIISOCYANATE | 584-84-9 | 7.0E-02 | | 1/01 | | | | | | | | | | | | X | |
| TOLUENE-2,6-DIISOCYANATE | 91-08-7 | 7.0E-02 | | 1/01 | | | | | | | | | | | | X | |
| TRICHLOROETHYLENE[TAC] | 79-01-6 | 6.0E+02 | | 4/00 | | | | | | X | | | | X | | | |
| TRIETHYLAMINE | 121-44-8 | 2.0E+02 | | 9/02 | | | | | | X | | X | | | | X | |
| VINYL ACETATE | 108-05-4 | 2.0E+02 | | 12/01 | | | | | | | | | | | | X | |
| VINYLIDENE CHLORIDE (1,1,-Dichloroethylene) | 75-35-4 | 7.0E+01 | | 1/01 | X | | | | | | | | | | | | |
| XYLENES (mixed isomers) | 1330-20-7 1210 | 7.0E+02 | | 4/00 | | | | | | | | | | X | | X | |
| m-XYLENE | 108-38-3 | 7.0E+02 | | 4/00 | | | | | | | | | | X | | X | |
| o-XYLENE | 95-47-6 | 7.0E+02 | | 4/00 | | | | | | | | | | X | | X | |
| p-XYLENE | 106-42-3 | 7.0E+02 | | 4/00 | | | | | | | | | | X | | X | |

| | |
|---|---|
| Purpose: | The purpose of this reference table is to provide a quick list of all health values that have been approved by the Office of Environmental Health Hazard Assessment (OEHHA) and the Air Resources Board (ARB) for use in facility health risk assessments conducted for the AB 2588 Air Toxics Hot Spots Program. The OEHHA has developed and adopted new risk assessment guidelines that update and replace the California Air Pollution Control Officers Association's (CAPCOA) *Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines, October 1993*. The OEHHA has adopted five technical support documents for these guidelines.<br><br>This table lists the OEHHA adopted inhalation and oral noncancer chronic RELs. In addition, it lists the substances in Appendix A-I *(Substances For Which Emissions Must Be Quantified*) and Appendix F (*Criteria For Inputs For Risk Assessment Using Screening Air Dispersion Modeling*) of the ARB's *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG)*. OEHHA is still in the process of adopting new noncancer chronic RELs. Therefore, new health values will periodically be added to, or deleted from, this table. Users of this table are advised to monitor the OEHHA website (*www.oehha.ca.gov*) for any updates to the health values. |
| ❁ | Substances written in *italics* and with a ✓ do not have explicit OEHHA approved health values, but are included in this table to clarify applicability of OEHHA adopted heath effects values to individual or grouped substances listed in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines*, Appendix A-I list of *"Substances For Which Emissions Must Be Quantified"*. |
| ▼ | Chemical Abstract Service Number (CAS): For chemical groupings and mixtures where a CAS number is not applicable, the 4-digit code used in the *Air Toxics "Hot Spots" Emission Inventory Criteria and Guidelines (EICG) Report* is listed. The 4-digit codes enclosed in brackets [ ] are codes that have been phased out, but may still appear on previously reported Hot Spots emissions. For information on the origin and use of the 4-digit code, see the EICG report. |
| | |
| ◆ | Date Value Reviewed [Added]: This column lists the date that the health value was last reviewed by OEHHA and the Scientific Review Panel, and/or approved for use in the AB 2588 Air Toxics "Hot Spots" Program. If the health value is unchanged since it was first approved for use in the "Hot Spots" Program, then the date that the value was first approved for use by CAPCOA is listed within the brackets [ ].<br><br>• February 2000, April 2000, January 2001, and December 2001 are listed for the first set of 22, the second set of 16, the third set of 22, and the fourth set of 12 noncancer chronic RELs, respectively.<br>• October 2000 is listed for the oral chronic RELs. The chronic REL for carbon disulfide was adopted in May 2002. Chronic RELS for phosphine and triethylamine were adopted in September 2002. Chronic RELs for fluorides including hydrogen fluoride were adopted August 2003.<br>• For the substances identified as Toxic Air Contaminants, the Air Resources Board hearing date is listed. The date for acetaldehyde represents the date the value was approved by the Scientific Review Panel. |
| TAC | Toxic Air Contaminant: The Air Resources Board has identified this substance as a Toxic Air Contaminant. |
| ★ | Polychlorinated Biphenyls:<br>Chronic Oral: The chronic oral value is U.S. EPA's 1996 oral Reference Dose for Aroclor-1254. |
| • | Polychlorinated Dibenzo-*p*-dioxins and Polychlorinated Dibenzofurans (also referred to as chlorinated dioxins and dibenzofurans): The OEHHA has adopted the World Health Organization 1997 (WHO-$_{97}$) Toxicity Equivalency Factor scheme for evaluating the cancer risk due to exposure to samples containing mixtures of polychlorinated dibenzo-*p*-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) and determining cancer risks for a number of specific PCB congeners. See Appendix A of OEHHA's *Technical Support Document For Describing Available Cancer Potency Factors* for more information about the scheme. See Appendix E of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for the methodology for calculating 2,3,7,8-equivalents for PCDD, PCDFs and a number of specific PCB congeners. |
| ■ | Particulate Emissions from Diesel-Fueled Engines: The unit risk factor and chronic REL were derived from whole diesel exhaust and should be used only for impacts from the inhalation pathway. The inhalation impacts from speciated emissions from diesel-fueled engines are already accounted for in the unit risk factor and REL. However, at the discretion of the risk assessor, speciated emissions from diesel-fueled engines may be used to estimate acute noncancer health impacts or the contribution to cancer risk or chronic noncancer health impacts for the non-inhalation exposure pathway. See Appendix D of OEHHA's *The Air Toxics Hot Spots Program Risk Assessment Guidelines; Part V; Technical Support Document; Guidance Manual for Preparation of Health Risk Assessments* for more information. |

Table last updated: August 2003